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AUGUST 2001

NATIONAL GEOGRAPHIC

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A woman celebrates art and anarchy at Burning Man, an annual weeklong festival in Black Rock Desert, Nevada.
PHOTOGRAPH BY MELISSA FARLOW

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From the Editor

NATIONAL GEOGRAPHIC PHOTOGRAPHER MICHAEL NICHOLS

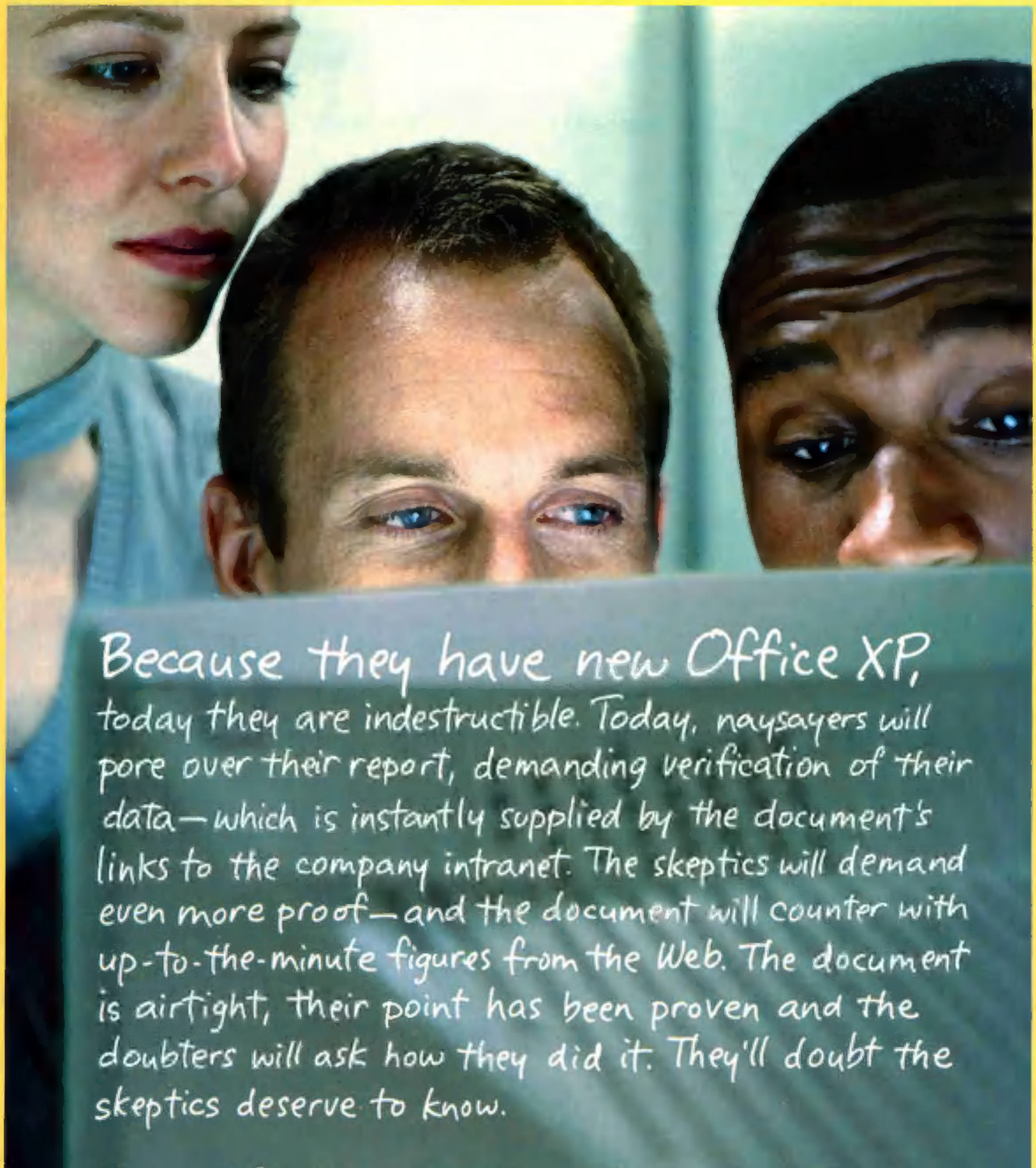
When is the end of a journey the beginning? Imagine struggling more than a year on foot through some of the most inhospitable land on the planet. On a typical day your team might wade through knee-deep muck, hack through impenetrable thickets, pull off scores of leeches, be swarmed by biting insects.

Now imagine the opportunity to observe and document an area as pristine as anything seen by Lewis and Clark on their great journey of exploration through the American West some 200 years ago. You will come face-to-face with animals that have never seen a human and are as curious about you as you are about them. You are an explorer with a chance to preserve untouched wilderness areas. You must lead a group of men by the force of your own will, by example, by rewards, by browbeating—anything it takes.

After 15 months, exhilarated and tired beyond tired, you break out of a mangrove swamp. There before you is the Atlantic Ocean, so vast that your companions from the interior of the continent can't comprehend it. Some are afraid of the waves and don't understand why there is so much useless water—water too salty to drink.

You are Mike Fay, and your work is just beginning. Even as you savor your accomplishment and watch hippos romping in the ocean, you know that the real worth of the ordeal you've been through is in the data collected, information that may lead to understanding and protecting this extraordinary place. The real journey is just beginning.

Bill Allen



Because they have new Office XP, today they are indestructible. Today, naysayers will pore over their report, demanding verification of their data—which is instantly supplied by the document's links to the company intranet. The skeptics will demand even more proof—and the document will counter with up-to-the-minute figures from the Web. The document is airtight, their point has been proven and the doubters will ask how they did it. They'll doubt the skeptics deserve to know.

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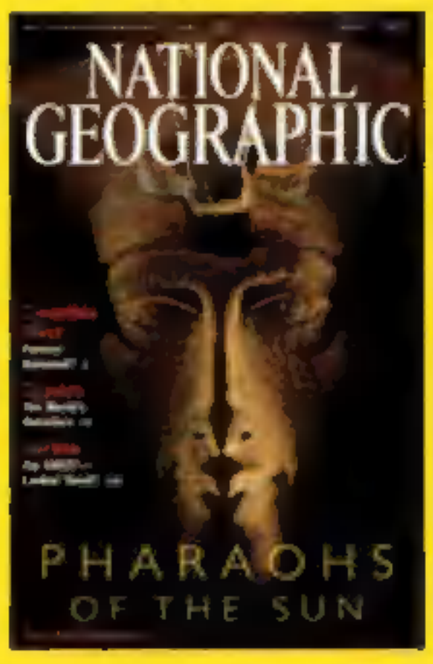


April 2001

Letters on the Columbia River dams, debating the future of salmon and the fortunes of the Pacific Northwest, flooded our offices. Grateful that we had examined this complex and important issue, one reader praised the article as a "grand example of unbiased reporting." Another firmly stated, "The livelihood of millions of people versus a fish. You gotta be kidding me!"

A River Dammed

Fen Montaigne's story on the Columbia River was fair and thought provoking. Getting a feel for the scale of the Columbia and its salmon challenge was absorbing reading. Definitely one of the better mainstream environmental articles I have read.

SHAUN MURPHY
Sydney, Australia

I am incensed by the one-sided environmentalist views presented in "A River Dammed." The economy of this region is suffering not only from a reduction of commercial fishing and canneries but also because of many environmental concerns, real or imagined! Millions of dollars have been shifted from economic development to environmental management. Now further economic growth is threatened by proposals to eliminate the dams. Aside from irrigation, the dams produce a significant amount of nonpolluting electrical power. We are in the midst of an energy crisis in California, and Washington State is being threatened with blackouts too. What will happen if the dams are breached and their generating capability is destroyed?

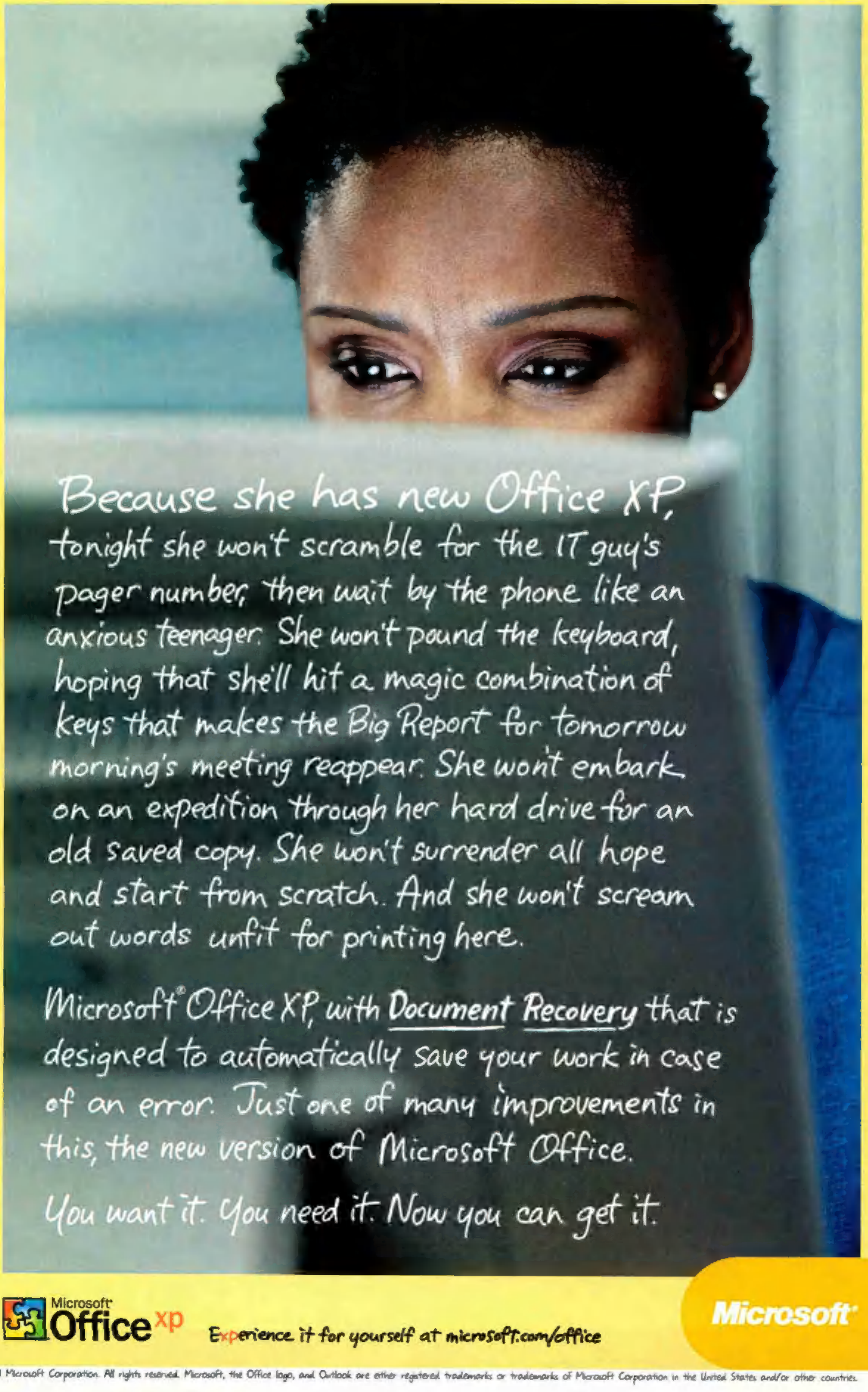
ARTHUR W. CLARKSON, JR.
Richland, Washington

Bill Watson, a farmer who raises apples and potatoes, thinks damming the Columbia River strengthens America (page 19). Here in Maine we also try to grow apples and potatoes. Our efforts have been in decline since about the time the Columbia was dammed and the water was made available to farmers. Coincidence? The government subsidies mean tax dollars in Maine are being used to our own detriment in supporting Columbia River projects. Strengthening America? Maybe your part of it.

DANIEL CHASE
Cape Elizabeth, Maine

Thank you for a wonderful and balanced article on dams and salmon. I'm a native of Oregon, and since I've been away from the Northwest, I've found that many Americans, especially in the East, have a distorted view of the Northwest. Yes, it's a beautiful place to live, and we should preserve it. However, we should be mindful that many call the Northwest home, and they hold a stake in how their resources are managed. Ultimately, decisions like whether to breach a dam or harvest a forest should be left up to them.

TROY D. CHRISTENSEN
Cincinnati, Ohio



ART BY MICHAEL MALLINSON AND ADAM HOWARD, REDVISION/4SITE

Pharaohs of the Sun

Radical Afrocentric thinkers claim that the ancient Egyptians were, across the board, black Africans. Most nonblack scholars claim they were not. It is most likely that the Egyptians were a highly hybridized population having origins in ethnic groups as various as we see in today's multiracial America. But surely Akhenaten and his mother, Queen Tiye, were black Egyptians—and Amarna court sculptors have represented them so, as can be seen on pages 54-5. The same holds for Akhenaten's father—Amenhotep III—Kiya, and Tutankhamun. Only blindness could conceal the blackness of these five Egyptians. So who are all those white people in the solar court on pages 50-51?

ROBERT ADAN WILLIAMS
Los Angeles, California

Depictions of Egyptian royalty vary markedly, making it impossible to discover their exact appearance. (Compare, for instance, the relief of Akhenaten on page 54 with the statue on page 44 and the sculpture on the cover.) According to scholars consulted for our reconstruction, ancient Egyptians probably resembled their modern descendants. Hence models who closely resemble modern-day Egyptians were selected for the artwork.

The Egyptians Map

Your statement about the source of the Nile being in the Ethiopian highlands is somewhat misleading. The source of the Nile is the Kagera River, a small stream in Tanzania that flows into Lake Victoria. From there it eventually becomes the White Nile and is joined by the Blue Nile (whose source is in the Ethiopian highlands) at Khartoum to become simply the Nile River.

RAYMOND R. ALLEN
Crawfordsville, Indiana

When you discussed the effects of dams on the salmon, you discussed only a small fraction of the problem. Most of the life cycle of the salmon is spent in the North Pacific Ocean. Less than one percent of them are coming home because of unlimited fishing and pollution from "free trade" policies. You can breach the dams, but the salmon will still end up on tables in Asia or dead from pollution.

PAUL NOEL
Harvest, Alabama

Flower Trade

Your article covered the global flower industry well and gave a good description of the route most flowers take to get to our vases. However, that route is not the only option for buying flowers. There are many flower farms thriving in the United States. Many growers realize that competing with foreign rose and carnation growers is unrealistic and have switched to specialty crops. At most farmers markets, customers can find sweet peas, delphiniums, cosmos, zinnias, and dahlias, and often these flowers are organically grown.

SUSAN O'CONNELL
Hardwick, Vermont

The author does not mention that big corporations are buying the best land in Third World countries. Land once used to feed the local population now furnishes flowers to rich countries. Banana republics are being changed into flower republics.

TADEUSZ DEBSKI
Chicago, Illinois

Gypsies—The Outsiders

Thank you for the eye-opening piece on Gypsies, but there is nary a mention of their contributions to society. Take Gypsy music. The impromptu Hungarian *czardas* performed by gifted, self-taught musicians is without equal in the music world. So is the celebrated guitar music of Gypsy jazz virtuoso Django Reinhardt.

PAUL H. LARIC
Mill River, Massachusetts

My experience of Gypsies in England is that their choice is to remain outsiders. They are, by their own preference, referred to as "travelers," and their children attend the local school with a sharp attitude of arrogance. The reality of the travelers is their disregard for the local community and—more surprising for a nomadic clan—their disregard and often willful destruction of their own resources. The

WRITE TO FORUM

National Geographic Magazine, PO Box 98198, Washington, DC 20090-8198, or by **fax** to **202-828-5460**, or via the Internet to **ngsforum@nationalgeographic.com.** Include name, address, and daytime telephone. Letters may be edited for clarity and space.

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Please read this summary carefully, and then ask your doctor about NEXIUM and PRILOSEC. No advertisement can provide all the information needed to prescribe a drug. This advertisement does not take the place of careful discussions with your doctor.
Only your doctor has the training to weigh the risks and benefits of a prescription drug for you.

Nexium™ *(esomeprazole magnesium)*

20-MG, 40-MG Delayed-Release Capsules

BRIEF SUMMARY Before prescribing NEXIUM, please see full Prescribing Information. **INDICATIONS AND USAGE** NEXIUM is indicated for the short-term treatment (4 to 8 weeks) in the healing and symptomatic resolution of diagnostically confirmed erosive esophagitis. **CONTRAINDICATIONS** NEXIUM is contraindicated in patients with known hypersensitivity to any component of the formulation or to substituted benzimidazoles. **PRECAUTIONS** Symptomatic response to therapy with NEXIUM does not preclude the presence of gastric malignancy. Atrophic gastritis has been noted occasionally in gastric corpus biopsies from patients treated long-term with omeprazole, of which NEXIUM is an enantiomer. **Information for Patients:** NEXIUM Delayed-Release Capsules should be taken at least one hour before meals. For patients who have difficulty swallowing capsules, one tablespoon of applesauce may be added to an empty bowl and the capsule opened, and the pellets carefully emptied onto the applesauce. The pellets should be mixed with the applesauce and then swallowed immediately. The applesauce used should not be hot and should be soft enough to be swallowed without chewing. The pellets should not be chewed or crushed. The pellet/applesauce mixture should not be stored for future use. Antacids may be used while taking NEXIUM. **DRUG INTERACTIONS** Esomeprazole is extensively metabolized in the liver by CYP2C19 and CYP3A4. *In vitro* and *in vivo* studies have shown that esomeprazole is likely to inhibit CYPs 1A2, 2A6, 2C9, 2D6, 2E1 and 3A4. No clinically relevant interactions with drugs metabolized by these CYP enzymes would be expected. Drug interaction studies have shown esomeprazole does not have any clinically significant interactions with phenytoin, warfarin, quinidine, clarithromycin or amoxicillin. Esomeprazole may potentially interfere with CYP2C19, a major esomeprazole-metabolizing enzyme. Coadministration of esomeprazole 30 mg and diazepam, a CYP2C19 substrate, resulted in a 45% decrease in clearance of diazepam. Increased plasma levels of diazepam were observed 12 hours after dosing and onwards. However, at that time, the plasma levels of diazepam were within the therapeutic interval, and such an interaction is unlikely to be of clinical relevance. Coadministration of oral contraceptives, diazepam, phenytoin, or quinidine did not appear to change the pharmacokinetic profile of esomeprazole. Esomeprazole inhibits gastric acid secretion; therefore, it is theoretically possible that esomeprazole and omeprazole may interfere with absorption of drugs where gastric pH is an important determinant of their bioavailability (eg, ketoconazole, ampicillin esters, digoxin, and iron salts). **Carcinogenesis, Mutagenesis, Impairment of Fertility:** The carcinogenic potential of esomeprazole was assessed using omeprazole studies. In two 24-month carcinogenicity studies in rats, omeprazole at daily doses of 1.7, 3.4, 13.8, 44.0 and 140.8 mg/kg/day (about 0.7 to 57 times the human dose of 20 mg/day expressed on a body surface area basis) produced gastric ECL cell carcinoids in a dose-related manner in both male and female rats; the incidence of this effect was markedly higher in female rats, which had higher blood levels of omeprazole. Gastric carcinoids seldom occur in the untreated rat. In addition, ECL cell hyperplasia was present in all treated groups of both sexes. In one of these studies, female rats were treated with 13.8 mg omeprazole/kg/day (about 5.6 times the human dose on a body surface area basis) for 1 year, then followed for an additional year without drug. No carcinoids were seen in these rats. An increased incidence of treatment-related ECL cell hyperplasia was observed at the end of 1 year (94% treated vs 10% controls). By the second year the difference between treated and control rats was much smaller (46% vs 26%) but still showed more hyperplasia in the treated group. Gastric adenocarcinoma was seen in one rat (2%). No similar tumor was seen in male or female rats treated for 2 years. For this strain of rat no similar tumor has been noted historically, but a finding involving only one tumor is difficult to interpret. A 78-week mouse carcinogenicity study of omeprazole did not show increased tumor occurrence, but the study was not conclusive. Esomeprazole was negative in the Ames mutation test, in the *in vivo* rat bone marrow micronucleus test, and in an *in vivo* mouse micronucleus test. Esomeprazole, however, was positive in an *in vitro* human lymphocyte chromosome aberration test. Omeprazole was positive in the *in vitro* human lymphocyte chromosome aberration test, the *in vivo* rat bone marrow micronucleus test, and the *in vivo* mouse micronucleus test. The potential effects of esomeprazole on fertility and reproductive performance were assessed using omeprazole studies. Omeprazole at doses up to 138 mg/kg/day in rats (about 56 times the human dose on a body surface area basis) was found to have no effect on reproductive performance of parental animals. **Pregnancy:** *Teratogenic Effects. Pregnancy Category* B - Teratology studies have been performed in rats at oral doses up to 280 mg/kg/day (about 57 times the human dose on a body surface area basis) and in rabbits at oral doses up to 86 mg/kg/day (about 35 times the human dose on a body surface area basis) and have revealed no evidence of impaired fertility or harm to the fetus due to esomeprazole. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed. Teratology studies conducted with omeprazole in rats at oral doses up to 138 mg/kg/day (about 56 times the human dose on a body surface area basis) and in rabbits at oral doses up to 69 mg/kg/day (about 56 times the human dose on a body surface area basis) did not disclose any evidence for a teratogenic potential of omeprazole. In rabbits, omeprazole in a dose range of 6.9 to 69 mg/kg/day (about 5.5 to 56 times the human dose on a body surface area basis) produced dose-related increases in embryo-lethality, fetal resorptions, and pregnancy disruptions. In rats, dose-related embryo/fetal toxicity and postnatal developmental toxicity were observed in offspring resulting from parents treated with omeprazole at 13.8 to 138.0 mg/kg/day (about 5.6 to 56 times the human doses on a body surface area basis). There are no adequate and well-controlled studies in pregnant women. Sporadic reports have been received of congenital abnormalities occurring in infants born to women who have received omeprazole during pregnancy. **Nursing Mothers:** The excretion of esomeprazole in milk has not been studied. However, omeprazole concentrations have been measured in human milk of a woman following oral administration of 20 mg. Because esomeprazole and omeprazole are likely to be excreted in human milk, and because of the potential for serious adverse reactions in nursing infants from esomeprazole and because of the potential for tumorigenicity shown for omeprazole in rat carcinogenicity studies, a decision should be made to discontinue the drug, taking into account the importance of the drug to the mother. **Pediatric Use:** Safety and effectiveness in pediatric patients have not been established. **Geriatric Use:** Of the total number of patients who received NEXIUM in clinical trials, 778 were 65 to 74 years of age and 124 patients were ≥ 75 years of age. No overall differences in safety and efficacy were observed between the elderly and younger individuals, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. **ADVERSE REACTIONS** The safety of NEXIUM was evaluated in over 10,000 patients (aged 18-84 years) in clinical trials worldwide including over 7,400 patients in the United States and over 2,600 patients in Europe and Canada. Over 2,900 patients were treated in long-term studies for up to 6-12 months. In general, NEXIUM was well tolerated in both short- and long-term clinical trials. The safety in the treatment of healing of erosive esophagitis was assessed in four randomized comparative clinical trials, which included 1,240 patients on NEXIUM 20 mg, 2,434 patients on NEXIUM 40 mg, and 3,008 patients on omeprazole 20 mg daily. The most frequently occurring adverse events (≥1%) in all three groups was diarrhea (5.5, 5.0, and 3.8, respectively) and diarrhea (no difference among the three groups). Nausea, flatulence, abdominal pain, constipation, and dry mouth occurred at similar rates among patients taking NEXIUM or omeprazole. Additional adverse events that were reported as possibly or probably related to NEXIUM with an incidence < 1% are listed below by body system: ***Body as a Whole:*** abdomen enlarged, allergic reaction, asthenia, back pain, chest pain, chest pain substernal, facial edema, peripheral edema, hot flushes, fatigue, fever, flu-like disorder, generalized edema, leg edema, malaise, pain, rigors; ***Cardiovascular:*** flushing, hypertension, tachycardia; ***Endocrine:*** goiter; ***Gastrointestinal:*** bowel irregularity, constipation aggravated, dyspepsia, dysphagia, dysplasia GI, epigastric pain, eructation, esophageal disorder, frequent stools, gastroenteritis, GI hemorrhage, GI symptoms NOS, hiccup, melena, mouth disorder, pharynx disorder, rectal disorder, serum gastrin increased, tongue disorder, tongue edema, ulcerative stomatitis, vomiting; ***Hearing:*** earache, tinnitus; ***Hematologic:*** anemia hypochromic, cervical lymphoadenopathy, epistaxis, leukocytosis, leukopenia, thrombocytopenia; ***Hepatic:*** bilirubinemia, hepatic function abnormal, SGOT increased, SGPT increased; ***Metabolic/Nutritional:*** glycosuria, hyperuricemia, hyponatremia, increased alkaline phosphatase, thirst, vitamin B12 deficiency, weight increase, weight decrease; ***Musculoskeletal:*** arthralgia, arthritis aggravated, arthropathy, cramps, fibromyalgia syndrome, hernia, polymyalgia rheumatica; ***Nervous System/Psychiatric:*** anorexia, apathy, appetite increased, confusion, depression aggravated, dizziness, hypertonia, nervousness, hypoesthesia, impotence, insomnia, migraine, migraine aggravated, paresthesia, sleep disorder, somnolence, tremor, vertigo, visual field defect; ***Reproductive:*** dysmenorrhea, menstrual disorder, vaginitis; ***Respiratory:*** asthma aggravated, coughing, dyspnea, larynx edema, pharyngitis, rhinitis, sinusitis; ***Skin and Appendages:*** acne, angioedema, dermatitis, pruritus, pruritus ani, rash, rash erythematous, rash maculo-papular, skin inflammation, sweating increased, urticaria; ***Special Senses:*** otitis media, parosmia, taste loss, taste perversion; ***Urogenital:*** abnormal urine, albuminuria, cystitis, dysuria, fungal infection, hematuria, micturition frequency, moniliasis, genital moniliasis, polyuria; ***Visual:*** conjunctivitis, vision abnormal. Endoscopic findings that were reported as adverse events include: duodenitis, esophagitis, esophageal strictura, esophageal ulceration, esophageal vances, gastric ulcer, gastritis, hernia, benign polyps or nodules, Barrett's esophagus, and mucosal discoloration. Other adverse events not observed with NEXIUM, but occurring with omeprazole can be found in the omeprazole package insert. **OVERDOSAGE** A single oral dose of esomeprazole at 510 mg/kg (about 103 times the human dose on a body surface area basis) was lethal to rats. The major signs of acute toxicity were reduced motor activity, changes in respiratory frequency, tremor, ataxia, and intermittent clonic convulsions. There have been no reports of overdosage with esomeprazole. Reports have been received of overdosage with omeprazole in humans. Doses ranged up to 2,400 mg (120 times the usual recommended clinical dose). Manifestations were variable, but included confusion, drowsiness, blurred vision, tachycardia, nausea, diaphoresis, flushing, headache, dry mouth, and other adverse reactions similar to those seen in normal clinical experience (see omeprazole package insert-**ADVERSE REACTIONS**). No specific antidote for esomeprazole is known. Since esomeprazole is extensively protein bound, it is not expected to be removed by dialysis. In the event of overdosage, treatment should be symptomatic and supportive. As with the management of any overdose, the possibility of multiple drug ingestion should be considered. For current information on treatment of any drug overdose, a certified Regional Poison Control Center should be contacted. Telephone numbers are listed in the Physicians' Desk Reference (PDR) or local telephone directory.

NEXIUM is a trademark of the AstraZeneca group of companies.

Prilosec® *(omeprazole)*

20-MG Delayed-Release Capsules

BRIEF SUMMARY Before prescribing PRILOSEC, please see full Prescribing Information. **INDICATIONS AND USAGE** *Erosive Esophagitis:* PRILOSEC Delayed-Release Capsules are indicated for the short-term treatment (4-8 weeks) in the healing of erosive esophagitis, which has been diagnosed by endoscopy. **CONTRAINDICATIONS Omeprazole** PRILOSEC Delayed-Release Capsules are contraindicated in patients with known hypersensitivity to any component of the formulation. **PRECAUTIONS** Symptomatic response to therapy with omeprazole does not preclude the presence of gastric malignancy. Atrophic gastritis has been noted occasionally in gastric corpus biopsies from patients treated long-term with omeprazole. **Information for Patients:** PRILOSEC Delayed-Release Capsules should be taken before eating and should not be opened, chewed or crushed, and should be swallowed whole. **DRUG INTERACTIONS** *Other* Omeprazole can prolong the elimination of diazepam, warfarin and phenytoin, drugs that are metabolized by oxidation in the liver. Although in normal subjects no interaction with theophylline or propranolol was found, there have been clinical reports of interaction with other drugs metabolized via the cytochrome P-450 system (eg, cyclosporine, disulfiram, and benzodiazepines). Patients should be monitored to determine if it is necessary to adjust the dosage of these drugs when taken concomitantly with PRILOSEC. Omeprazole inhibits gastric acid secretion, therefore, it is theoretically possible that omeprazole may interfere with absorption of drugs where gastric pH is an important determinant of their bioavailability (eg, ketoconazole, ampicillin esters, digoxin, and iron salts). In clinical trials, antacids were used concomitantly with the administration of PRILOSEC. **Carcinogenesis, Mutagenesis, Impairment of Fertility:** In two 24-month carcinogenicity studies in rats, omeprazole at daily doses of 1.7, 3.4, 13.8, 44.0 and 140.8 mg/kg/day (approximately 4 to 352 times the human dose, based on a patient weight of 50 kg and a human dose of 20 mg) produced gastric ECL cell carcinoids in a dose-related manner in both male and female rats; the incidence of this effect was markedly higher in female rats, which had higher blood levels of omeprazole. Gastric carcinoids seldom occur in the untreated rat. In addition, ECL cell hyperplasia was present in all treated groups of both sexes. In one of these studies, female rats were treated with 13.8 mg omeprazole/kg/day (approximately 35 times the human dose) for 1 year, then followed for an additional year without the drug. No carcinoids were seen in these rats. An increased incidence of treatment-related ECL cell hyperplasia was observed at the end of 1 year (94% treated vs 10% controls). By the second year the difference between treated and control rats was much smaller (46% vs 26%) but still showed more hyperplasia in the treated group. An unusual primary malignant tumor in the stomach was seen in one rat (2%). No similar tumor was seen in male or female rats treated for two years. For this strain of rat no similar tumor has been noted historically, but a finding involving only one tumor is difficult to interpret. A 78-week mouse carcinogenicity study of omeprazole did not show increased tumor occurrence, but the study was not conclusive. Omeprazole was not mutagenic in an *in vitro*

Ames *Salmonella typhimurium* assay, *in vitro* mouse lymphoma cell assay and an *in vivo* rat liver DNA damage assay. A micronucleus test at 625 and 6250 times the human dose gave a borderline result, did an *in vivo* bone marrow chromosome aberration test. A second mouse micronucleus study at times the human dose, but with different (suboptimal) sampling times, was negative. In a rat fertility and general reproductive performance test, omeprazole in a dose range 13.8 to 138.0 mg/kg/day (approximately 35 345 times the human dose) not toxic or deleterious to the reproductive performance of parental animals. **Pregnancy:** *Category C* - Teratology conducted pregnant rats at doses up 138 mg/kg/day (approximately 345 times the human dose) and in pregnant rabbits at doses mg/kg/day (approximately 172 times the human dose) not disclose any evidence for a teratogenic potential of omeprazole). In rabbits, omeprazole in a range of 6.9 to 69.1 mg/kg/day (approximately 17 to 172 times the human dose) produced dose-related increases in embryo-lethality, fetal resorptions pregnancy disruptions. In rats, dose-related embryo/ fetal toxicity and postnatal developmental toxicity were observed offspring resulting from parents treated with omeprazole 13.8 to 138.0 mg/kg/day (approximately 35 to 345 times the human dose). There are no adequate or well-controlled studies in pregnant women. Sporadic reports have received of congenital abnormalities occurring in infants born to who have received omeprazole during pregnancy. Omeprazole should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. **Nursing Mothers:** It is not known whether omeprazole is excreted in human milk. In rats, omeprazole administration during late gestation lactation at doses of 13.8 to 138 mg/kg/day (35 to 345 times the human dose) resulted in weight in pups. Because many drugs are excreted in human because of the potential for serious adverse reactions in nursing infants from omeprazole, and because potential for tumorigenicity shown for omeprazole rat carcinogenicity studies, a decision should made whether to discontinue nursing or discontinue the drug, taking into account the importance of the drug to the mother. **Pediatric Use:** Safety and effectiveness in pediatric patients have not been established. **Geriatric Use:** overall differences in safety efficacy were observed between the elderly and younger individuals, and other reported clinical experience not identified differences in responses between the elderly and younger patients, greater sensitivity of some older individuals be out. **ADVERSE REACTIONS** In the U.S. clinical trial population of patients (including duodenal ulcer, Zollinger-Ellison syndrome and resistant ulcer patients), the following adverse experiences were reported occur 1% or of patients therapy with PRILOSEC. Numbers in parentheses indicate percentages of the adverse experiences considered by investigators as possibly, probably or definitely related to the drug.

	Omeprazole (n=465)	Placebo (n=64)	Ranitidine (n=195)
Headache	6.9 (2.4)	6.3	7.7 (2.6)
Diarrhea	3.0 (1.9)	3.1 (1.6)	2.1 (0.5)
Abdominal Pain	2.4 (0.4)	3.1	2.1
Nausea	2.2 (0.9)	3.1	4.1 (0.5)
URI	1.9	1.6	2.6
Dizziness	1.5 (0.6)	0.0	2.6 (1.0)
Vomiting	1.5 (0.4)	4.7	1.5 (0.5)
Rash	1.5 (1.1)	0.0	0.0
Constipation	1.1 (0.9)	0.0	0.0
Cough	1.1	0.0	1.5
Asthenia	1.1 (0.2)	1.6 (1.6)	1.5 (1.0)
Back Pain	1.1	0.0	0.5

The following adverse reactions which occurred in 1% or more of omeprazole-treated patients have reported in international double-blind, open-label clinical trials in which 2,631 patients and subjects received omeprazole 120 patients took a placebo. A causal relationship was not assessed. The percentages are given omeprazole then placebo, respectively. *Body as a Whole, site unspecified:* Abdominal Pain 5.2% 3.3%; Asthenia 1.3% and 0.8%. *Digestive System:* Constipation 1.5 0.8; Diarrhea 3.7 and 2.5; Flatulence 2.7 5.6; Nausea 4.0 and 6.7; Vomiting 3.2 and 10.0; Acid regurgitation 1.9 3.3; *Nervous System/Psychiatric:* Headache 2.9 and 2.5. Additional adverse experiences occurring in < 1% of patients or subjects domestic and/or international trials, or occurring since the drug was marketed, are shown below within each body system many instances, relationship to PRILOSEC was unclear. *Body As a Whole:* Allergic reactions, including, rarely, anaphylaxis (see also *Skin* below), fever, pain, fatigue, malaise, abdominal swelling. *Cardiovascular:* Chest pain or angina, tachycardia, bradycardia, palpitation, elevated pressure, peripheral edema. *Gastrointestinal:* Pancreatitis (some fatal), anorexia, irritable colon, flatulence, fecal discoloration, esophageal candidiasis, mucosal atrophy of the tongue, dry During treatment with omeprazole, gastric fundic gland polyps have been noted rarely. These polyps are benign appear to be reversible when treatment is discontinued. Gastroduodenal carcinoids have been reported in patients with ZE syndrome on long-term treatment with PRILOSEC. This finding is believed to manifestation the underlying condition, which is known to be associated with such tumors. *Hepatic:* Mild and, rarely, elevations of function tests [ALT (SGPT), AST (SGOT), γ-glutamyl transpeptidase, alkaline phosphatase, and bilirubin (jaundice)]. In instances, overt liver disease has occurred, including hepatocellular, cholestatic, or mixed hepatitis, liver necrosis (some fatal), hepatic (some fatal), and hepatic encephalopathy. *Metabolic/Nutritional:* Hyponatremia, hypoglycemia, weight *Musculoskeletal:* Muscle cramps, myalgia, muscle weakness, joint pain, leg *Nervous System/Psychiatric:* Psychic disturbances including depression, aggression, hallucinations, confusion, insomnia, nervousness, tremors, apathy, somnolence, anxiety, dream abnormalities, vertigo; paresthesia; hemifacial dysesthesia. *Respiratory:* Epistaxis, pharyngeal pain. *Skin:* Rash and, rarely, severe generalized reactions including toxic epidermal necrolysis (TEN; some fatal), Stevens-Johnson syndrome, erythema multiforme (some severe); purpura and/or petechiae (some with rechallenge); skin inflammation, urticaria, angioedema, pruritus, alopecia, dry skin, hyperhidrosis. *Special Senses:* Tinnitus, taste perversion. *Urogenital:* Interstitial nephritis (some with positive rechallenge), urinary tract infection, microscopic pyuria, urinary frequency, elevated creatinine, proteinuria, hematuria, glycosuria, testicular pain, gynecomastia. *Hematologic:* Rare instances of pancytopenia, agranulocytosis (some fatal), thrombocytopenia, neutropenia, anemia, leucocytosis, and hemolytic anemia have been reported. **OVERDOSAGE** Rare reports been received of overdosage with omeprazole. Doses ranged from 320 mg to 900 mg (16-45 times the usual recommended clinical dose). Manifestations were variable, but included confusion, drowsiness, blurred vision, tachycardia, nausea, diaphoresis, flushing, headache, and dry mouth. Symptoms transient, and serious clinical outcome has been reported. specific antidote for omeprazole overdosage known. Omeprazole is extensively protein and is, therefore, not readily dialyzable. In the event of overdosage, treatment should be symptomatic and supportive.

PRILOSEC is a registered trademark of the AstraZeneca group of companies.

202389 4/01

AstraZeneca

NOTE: This summary provides important information about NEXIUM and PRILOSEC. If you would more information, ask your doctor or pharmacist to let you read the professional labeling and then discuss it with them.

romanticism with which they are portrayed is pure fiction.

DEBBIE FEWTRELL
Prees, England

I think the life of the Gypsies in Slovakia is more complex than pictured in the article. There is virtually no illiteracy among the adult Roma in Slovakia. There are successful musicians, entrepreneurs, a professional Roma theater, and a department of Roma culture and education, with Roma students and professors, at the University of Constantine the Philosopher in Nitra. It is a shame that 100,000 people live in conditions like Hermanovce, but it is not only the scarcity of the state's finances. It is also the lack of will of the population to change its destiny.

ANTON HRNKO
Former member of Parliament
Stupava, Slovakia

As an American female member of an oppressed race, I have sympathy for the Roma. I can understand intensely how they must feel when they are discriminated against. But the practice of wealthy Gypsies looking down on their own people must end. They should be doing all they can to help their fellow Roma, just as some African Americans, Hispanics, and other minorities help their own.

CARMEN SMITH
Winston-Salem, North Carolina

Tomasz Tomaszewski's photograph of the beautiful dancer on pages 88-9 dancing her heart out in that café gives new meaning to the word "life."

ROGER DUBOIS
Dieppe, New Brunswick

Pursuing the Minke

Your article missed the essential point about why the United States opposes the resumption of commercial whaling. The official U.S. position has been that an international regulatory regime is required before commercial whaling can start again. But both the Norwegians and Japanese balked at putting the necessary, tough regulations in place. Douglas Chadwick quotes the Norwegians as asking why the U.S. tolerates whaling by natives but criticizes Norway. The answer is that the native whaling is done under an internationally agreed-on protocol. The hunt is carefully regulated and noncommercial. You also make a common mistake when you say the estimate of allowable Minke harvest is "ultraconservative." Yes, the number proposed is less than one percent of stocks, but it is not ultraconservative. The allowable harvest is the best estimate for sustainable whaling. In the past lower quotas were not followed, and we saw the devastation of many species.

D. JAMES BAKER
Former U.S. Commissioner,
International Whaling Commission
Washington, D.C.

Thanks to NATIONAL GEOGRAPHIC for bringing attention to the continued exploitation of minke whales. However, it is misleading to say that minke whales were "never seriously depleted." This ignores the status and threats to different minke species, subspecies, and regional populations. DNA testing of whale meat sold in Japanese and Korean markets has shown that many of these products originate from a genetically distinct population of minke whales found in the East Sea (Sea of Japan). Although Korea has no official whaling program, commercial markets are supplied with meat from whales drowned incidentally in fishing nets. The Korean government reported that more than 120 minke whales were killed as fisheries bycatch in coastal waters in 1996. Estimates from DNA testing suggest that a similar number of minke whales from this population are sold annually in Japan. At this rate this unique coastal population of minke whales is expected to decline toward extinction over the next few decades, despite the ostensible moratorium on whaling.

At this rate this unique coastal population of minke whales is expected to decline toward extinction over the next few decades, despite the ostensible moratorium on whaling.

C. SCOTT BAKER
New Zealand Delegate to the
Scientific Committee of the
International Whaling Commission
Auckland, New Zealand

ZipUSA: Harlem, New York

Amid a world of off-key themes, I found "Lookin' Good in Harlem" to be hip and in time—in time, hopefully, to preserve a genuine piece of American history and culture.

MIKE VINSON
McMinnville, Tennessee

DID THE MOUNTAINS TELL HIM STORIES?

[illegible]

[illegible]

[illegible]

EarthPulse

INNOVATORS

One by One, Voices Heard

Goldman winners fend for the Earth against all odds

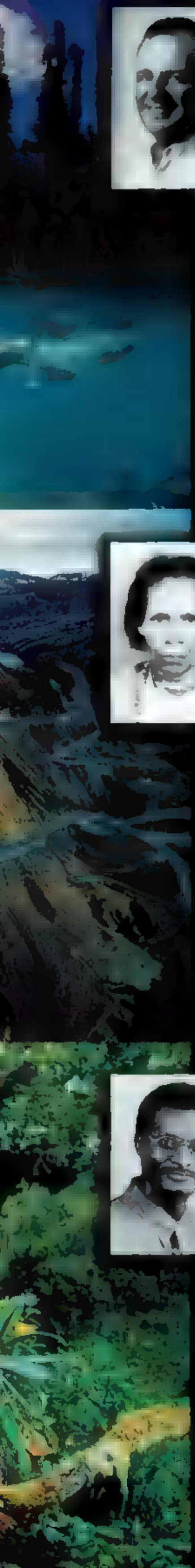
Some well-organized groups can mount high-publicity campaigns to halt a dam or save a forest. It's more difficult for individuals who work alone, sowing seeds of concern at the grassroots level. Yet they can be equally effective, pointing to pollution in India's Ganges River, to Samoan rain forests under threat of logging, or to the loss of traditional healing plants in Madagascar.

Each year since 1990 six activists chosen from around the globe have been awarded the Goldman Environmental Prize, established by philanthropist Richard N. Goldman and his late wife, Rhoda. Nominations come from a panel of environmental experts and from 27 organizations, including the National Geographic Society. This year's winners (facing page) will each receive $125,000.

Some of these extraordinary ordinary people have suffered repression. One even died—Nigerian Ken Saro-Wiwa, who fought for a share of oil revenue for his people. He was accused of murder and hanged by the Nigerian government in 1995. In Russia Alexander Nikitin was jailed for most of 1996 after publishing information about nuclear submarine accidents. Last year another winner, Rodolfo Montiel Flores, who led protests against logging in a Mexican mountain range, was sentenced to six years in prison on disputed weapons and drug charges.

In response, the Goldman winners have created a council of recipients, an environmental SWAT team of sorts, that monitors such dire situations and can come to the aid of threatened activists.

PETER ESSICK (TOP); GEORGE STEINMETZ (MIDDLE); MICHAEL NICHOLS, NGS; PORTRAITS COURTESY GOLDMAN ENVIRONMENTAL PRIZE



Bruno Van Peteghem

A Mullet [illegible] through a crystalline New Caledonia lagoon, but not all the [illegible] Pacific archipelago's waters are so unspoiled. [illegible] Caledonia holds perhaps 40 percent of [illegible] world's nickel, worked in a dozen mining centers. Van Peteghem drew attention [illegible] decades [illegible] harmful mining [illegible] such as dumping waste products on [illegible] and publicized plans for new mines. An Air France [illegible] attendant, [illegible] urges the involved governments —New Caledonia is a [illegible] of France—to work to have the reefs [illegible] a UNESCO World Heritage site.

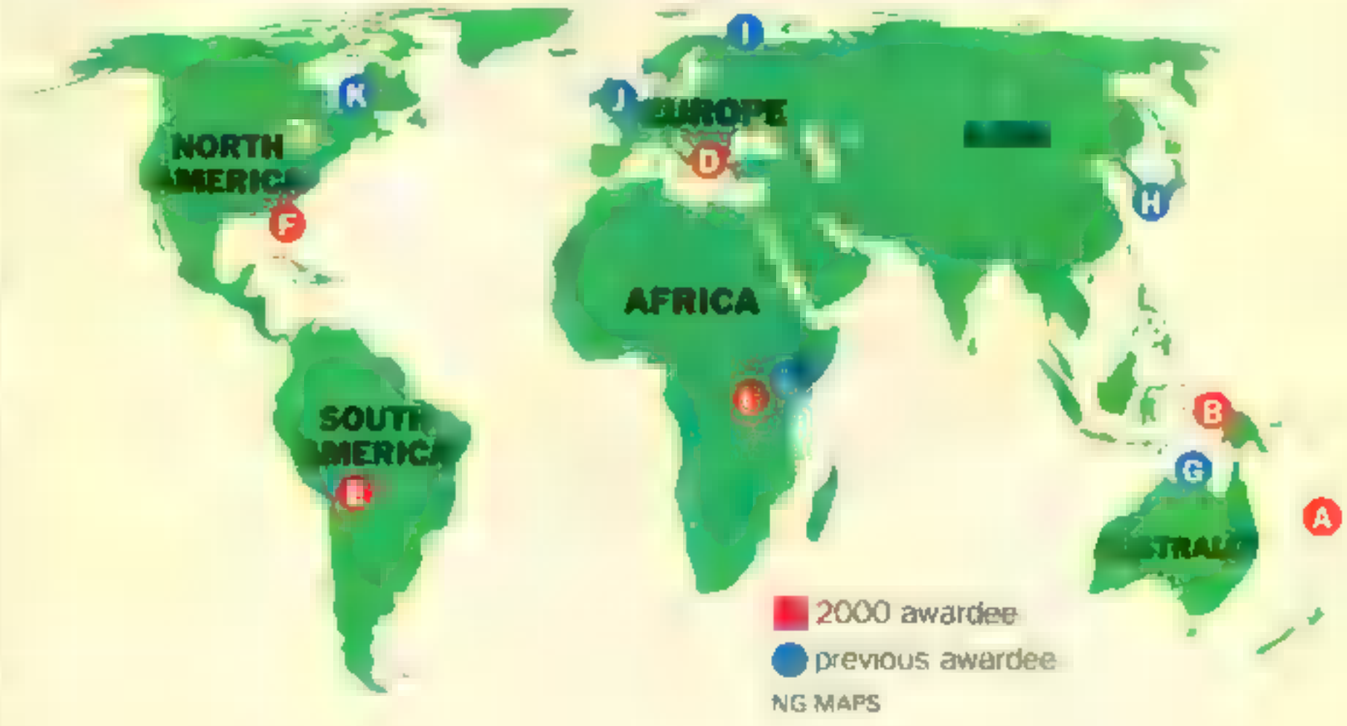
Yosepha Alomang

B This mother of five took on a mountain of [illegible] the Grasberg mine in Indonesia's province of Irian [illegible] For 20 years Alomang [illegible] opposed [illegible] owner of the [illegible] which bulldozed the top of a [illegible] revered by her people, the Amungme. In [illegible] in response [illegible] her activism, she was detained [illegible] weeks by Indonesian [illegible] to seek redress for the mining operations, but progress is slow. In May 2000 a rock pile at the mine collapsed into a sacred Amungme [illegible], killing four and flooding [illegible]

Eugène Rutagarama

C A Rwandan [illegible] and conservationist, Rutagarama fled his country's ethnic strife four times between 1960 and [illegible], once after several months as a [illegible] In the aftermath of the [illegible] genocide that [illegible] as many as a million [illegible], including most of his [illegible] Rutagarama returned to reorganize Rwanda's devastated national park system. He [illegible] the impact of two million [illegible] on the region's 355 [illegible] mountain gorillas and maintained monitoring efforts. [illegible] serves as a manager for the International Gorilla Conservation [illegible]

Where the Goldmans Were Won



Giorgos Catsadorakis, Myrsini Malakou

D Cooperation on anything among Balkan nations is rare, yet two biologists have induced Greece, Albania, and Macedonia to safeguard the Prespa wetlands that cross their borders. Growing fava beans, a single crop requiring irrigation and fertilizers, displaced time-honored methods and degraded the wetlands. The awardees foster traditional land management practices for healthy diversification. They were nominated by National Geographic.

Oscar Olivera

E A "war for water" broke out in 1999 in Cochabamba, Bolivia. Its 600,000 people protested after the government sold distribution rights to their water supply to a multinational corporation. Olivera, a union leader, headed a coalition that succeeded in returning the waterworks to local control.

Jane Akre, Steve Wilson

F Honored for their work on environmental and health issues, television reporters Akre and Wilson investigated the effects of a product called rBGH, recombinant bovine growth hormone, which increases cows' milk production. Allegedly pressured by the hormone's manufacturer, their Florida TV station refused to air the story and fired them. Akre won $425,000 in a lawsuit against the station.

Notable Past Winners

G Jacqui Katona and Yvonne Margarula, 1999
These two Aboriginal women led a campaign against mining Jabiluka, an Australian uranium deposit inside a national park. Operations have now been suspended.

H Hirofumi Yamashita, 1998
A Japanese fisheries activist, Yamashita fought against draining Isahaya Bay to create farmland. The project is currently being reevaluated.

I Alexander Nikitin, 1997
Concerned about radiation leaks from sunken submarines' nuclear reactors, the former Soviet naval captain published their Barents Sea locations and was jailed.

J Emma Must, 1995
An English librarian, she chained herself to a bulldozer to oppose a road through fragile Twyford Down. The road, one of nearly 600 projects in a national program, was built, but almost all the others have been dropped.

K Matthew Coon Come, 1994
As Grand Chief of the Cree, he battled huge hydroelectric projects in Quebec, halting some plans.

L Wangari Maathai, 1991
This activist launched Kenya's Green Belt Movement to combat deforestation and desertification.

Get Involved

For more information on the Goldman Prize:
goldmanprize.org

UNESCO World Heritage sites:
unesco.org

Imagine being the has to explain this

dinner table.

WWW.FORD.COM

WILL CAUSE:	BETTER IDEA #12
Drinking water	
AACHEN, GERMANY	

dad who one at the

1. Hydrogen
(and if there's anything this planet has, it's hydrogen) goes here.

2. Hydrogen connects with oxygen here.

They get to know one another.
Sparks fly.
Motor turns.
Wheels turn.
You get to the grocery store.

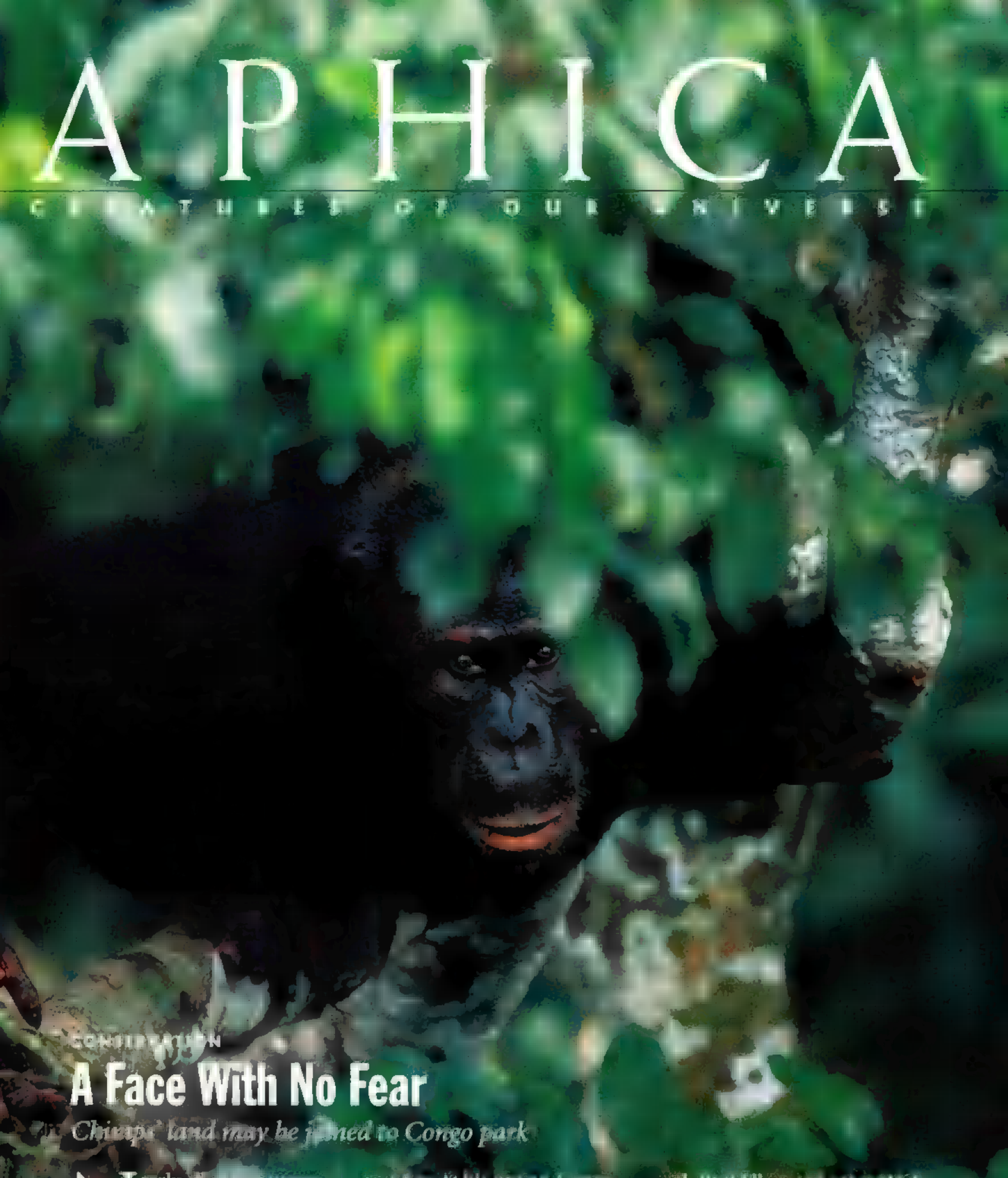
3. Water, that's right, water, comes out here.

GEOGR

THE PEOPLE, PLACES, AND

AFRICA

CREATURES OF OUR UNIVERSE



CONSERVATION

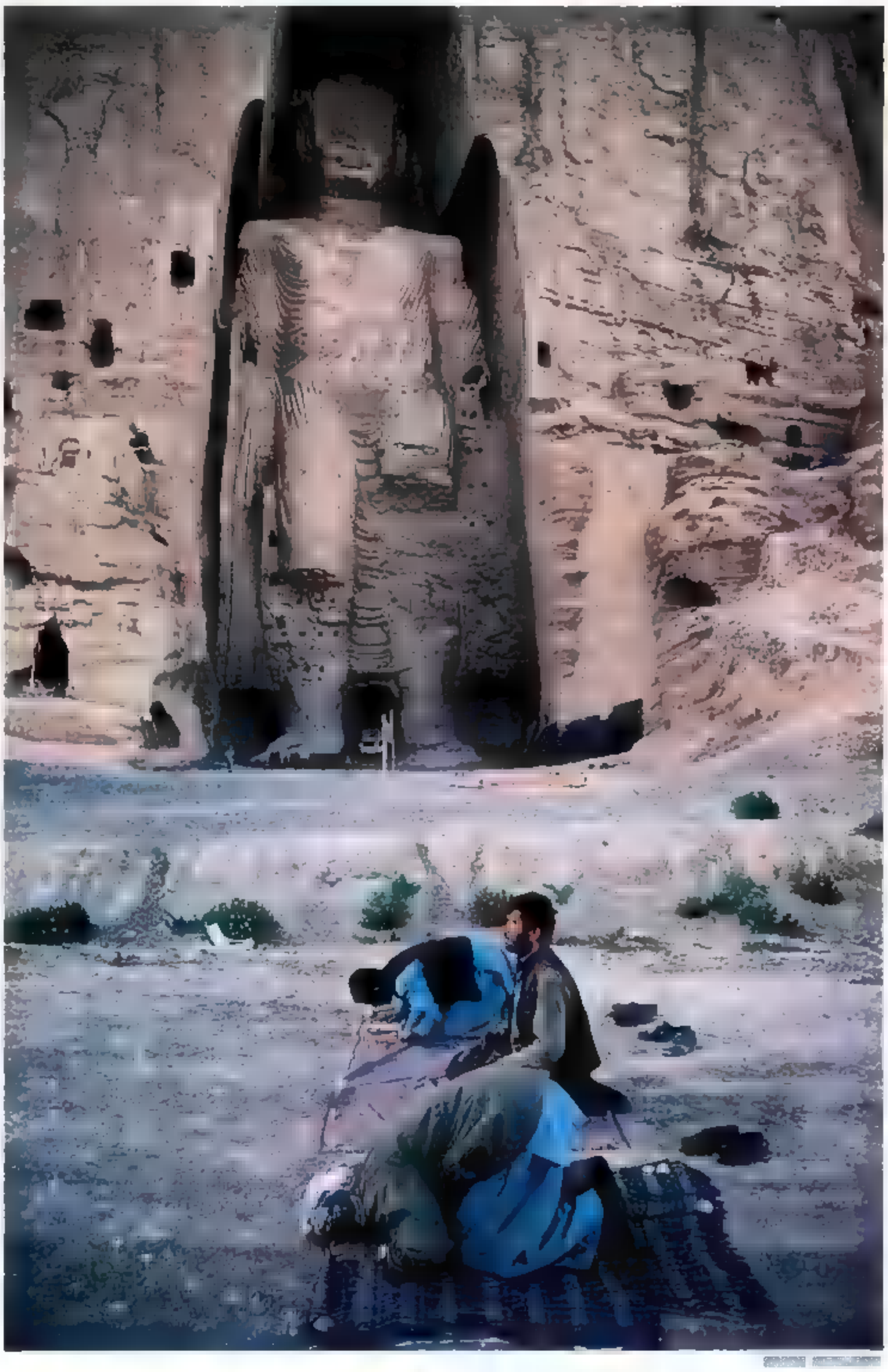
A Face With No Fear

Chimps' land may be joined to Congo park

Nearly all chimpanzees in central Africa have learned to flee at the sound of human voices. Poachers hunt them for food. But in 1990 Michael Fay of the Wildlife Conservation Society (WCS) discovered chimps in the Republic of the Congo that had probably never seen people before. They stared at us for hours,

say Fay. At his urging, Congo officials created Nouabalé-Ndoki National Park in 1993. But an area within the chimps' primary range, called the Goualougo Triangle, was excluded.

The Goualougo lies within a forest block that Congolese industrialist Jean Bois. As he planned his camp into Mea transect [illegible] Fay [illegible] with Paul Elkan [illegible] colleagues [illegible] to join the area. The [illegible] and has [illegible] to the government that it add the [illegible] to the park. A [illegible] for Congo parks [illegible] more [illegible] go to *www.nation*



ART

Blown Away in Afghanistan

Taliban leaders destroy ancient Buddhist art

The two Buddhas carved into the cliffside had towered over Bamian, an embattled Afghanistan town, since the third and fifth centuries. Last March leaders of that nation's Taliban government followed through on their threat to destroy the roughly 120- and 175-foot statues, which they decreed an affront to Islam. Despite international protest, soldiers fired explosives at the sandstone figures, one of which (left, in 1992) was among the tallest Buddhas in the world.

A summit of Islamic leaders immediately denounced the destruction of the statues. And, in an effort to encourage understanding of Islam and dispel the notion that it advocates violence, Egypt's Al-Azhar mosque announced that it will make available on the Internet all 42,000 of its priceless ancient manuscripts.

ALMANAC

August

Picnickers in the Northern Hemisphere risk hordes of hungry yellow jackets. Near the end of their colonies' life cycle, their numbers peak while prey such [redacted] caterpillars grow scarce. The wasps mob easy pickings from plates or trash. Only queens survive the winter.

[redacted] PETER GAEDE

GEOGRAPHY

Nations by Any Other Name

Can you recognize the names of these nations in their native languages?

1. Ellas
2. Shqipëria
3. Al Maghrib
4. Zhongguo
5. Suomi
6. Sverige
7. Bharat
8. Magyarország
9. Schweiz

ANSWERS: 1. Greece 2. Albania 3. Morocco 4. China 5. Finland 6. Sweden 7. [redacted] 8. Hungary 9. Switzerland

ART BY RICHARD THOMPSON

Nature's Healthclub

Mother Nature's Newest Member

...Introducing the chewy 100% natural

fruit and nut snack with great oat

taste and whole grain goodness

The Energy Bar Nature Intended

HANS-CHRISTIAN HEAP

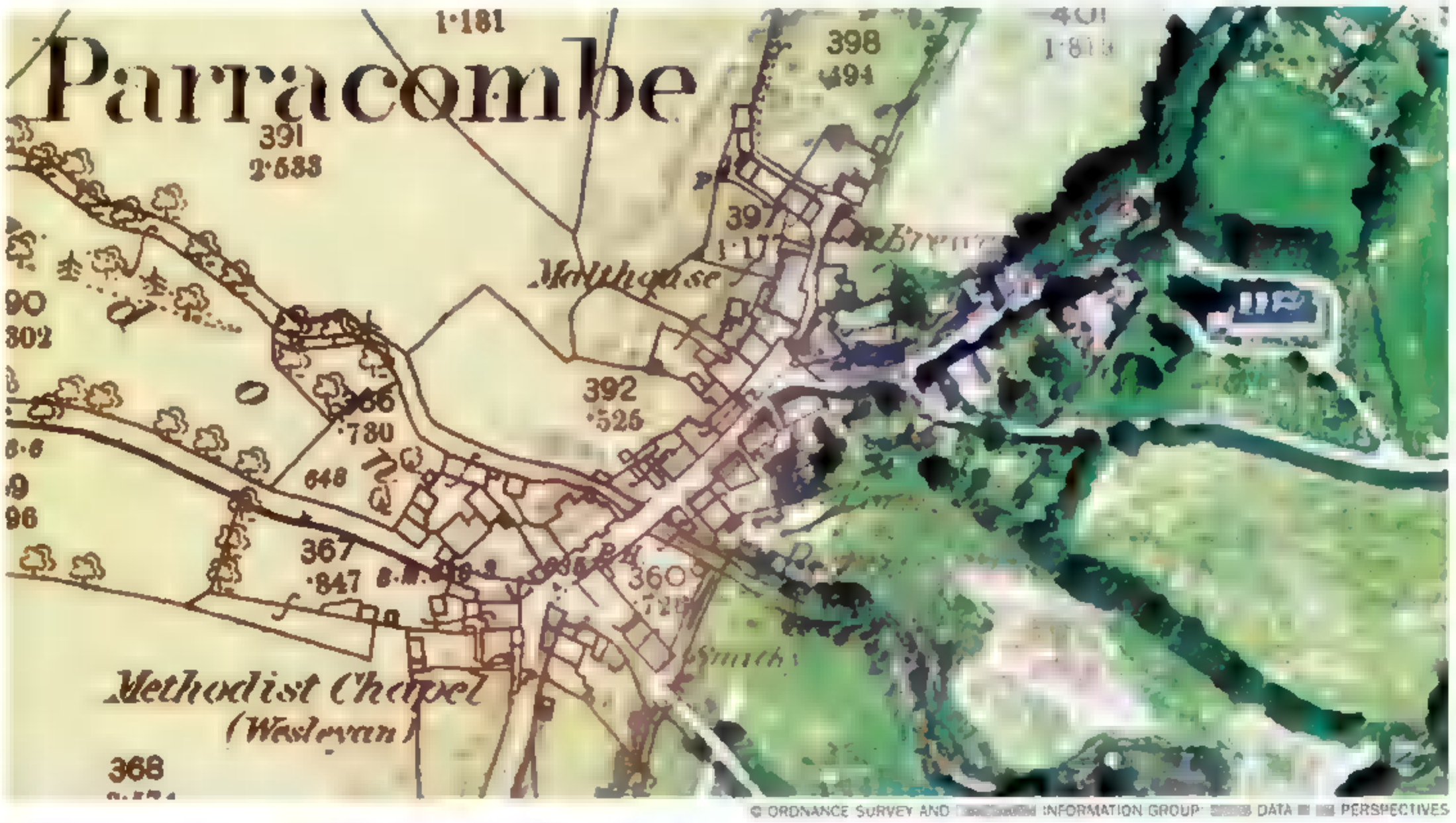
NATURE

Sting to Bring Relief?

Scorpion could point to new painkiller

A creature to avoid at all costs, the yellow Israeli scorpion packs a sting that injects about a hundred different toxins into its victim. Ironically, one of those chemicals may lead to improved painkillers for humans, says Stefan H. Heinemann and colleagues at the Friedrich Schiller University in Jena, Germany.

Unlike many common painkillers, which dull the mind as well as the pain, the toxin, called Lqh III, affects nerve cells only in the body, not in the brain. Heinemann hopes that that selective quality can one day be built into pain relievers. "We need substances that discriminate like Lqh III but also inhibit the transmission of pain signals," Heinemann explains.



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CARTOGRAPHIC

New Views of a Green and Pleasant Land

For more than 150 years British cartographers have lavished attention on their beloved countryside. The 19th-century "County Series"—seen here in detail for the village of Parracombe (above, at left)—mapped England, Scotland, and Wales down to the cottages and hedgerows. Now the feat is being repeated with new technology. England's Map Accurate Photographic Survey (MAPS) is piecing together thousands of aerial photos into enormous digital images. Overlaid (above, at right) on the old view of Parracombe, this corner of England has hardly changed at all.

BONAMPAK

LIMITED EDITION PRINTS

Portion of "Dance of the Musicians," Room One, North Wall

Five stunning scenes from the Mayan ruins at Bonampak, Mexico are now available as a set of 20" x 24" high quality color prints. The digitally reconstructed illustrations first appeared in the now out-of-print February 1995 issue of NATIONAL GEOGRAPHIC. Each picture includes a descriptive summary of the scene.

Product code #D581821. Each set costs $100.00 (in Canada, $C144.68) plus $6.50 S&H. For orders to CA, DC, FL, KY, MD, MI, PA, and Canada please include appropriate tax. Call toll free (888) 647-7301 to order. Outside the U.S. and Canada call (515) 362-3353. Mail orders to National Geographic Society, P.O. Box 11303, Des Moines, Iowa 50340-1303 BP2001

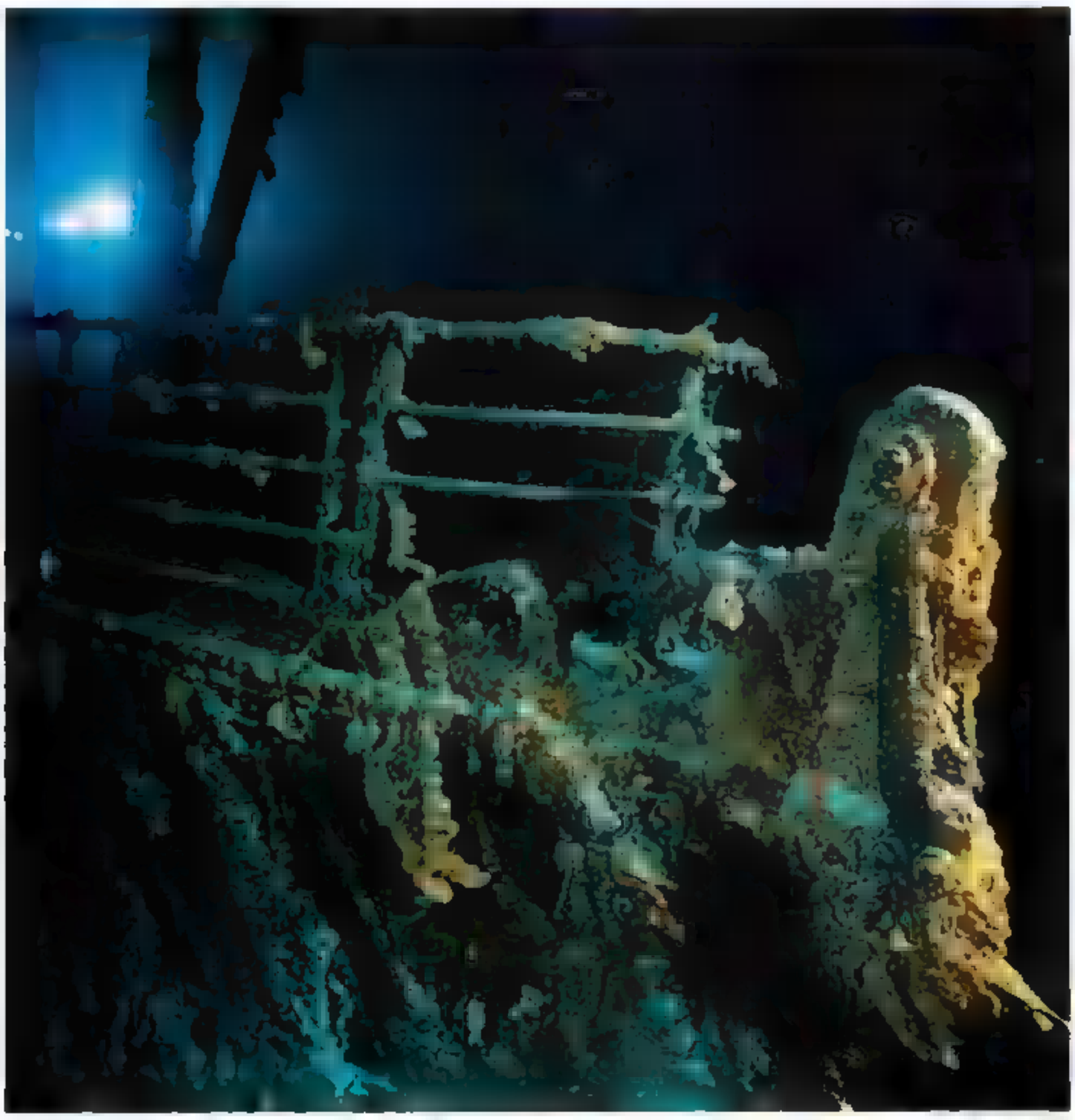
NGS RESEARCH GRANT

South African Finds

New light has been shed on some very old animals by Society grantee Callum Ross of the State University of New York at Stony Brook. His recent work focuses on the little-known fauna of southern Africa's late Cretaceous period.

Here Ross, at left, and associate Roger Smith of the South African Museum in Cape Town examine the fossil of a just discovered frog species. It is one of more than 200 specimens of amphibian, dinosaur, and plant remains the team has unearthed beneath farmland in South Africa's Northern Cape Province. The paleontologists dug a 40-foot-deep pit into the bed of a long-dry crater lake—revealing its hopping occupants of more than 70 million years ago.

CLAUDIO VELASQUEZ



EMORY KRISTOF

SHIPWRECKS

Sinking the Salvagers

In the summer of 2000 a salvage company using high-tech equipment scoured the crumbling *Titanic* (left) for a new haul of valuables and other artifacts—they had already recovered some 5,000 objects. Now international guidelines proposed by the National Oceanic and Atmospheric Administration ban the sale of such artifacts and limit salvage. Like many lost ships, the *Titanic*, says NOAA, is more than just a wreck; it is "a maritime memorial, a grave site and an underwater museum and laboratory."

Before
nasal allergies
change your life

Make an easier Change

Coping with the handicap of nasal allergies can get really frustrating.

Of course, you would never go to these extremes. But before you change your life, maybe you should make an easier change. Ask your doctor about FLONASE.

Using multi-symptom FLONASE Nasal Spray once a day can relieve all these nasal allergy symptoms — congestion, sneezing, and itchy, runny nose — all day and night. Results may vary.

If side effects occur, they are generally mild, and may include headache, nosebleed, or sore throat. For best results, use daily. Maximum relief may take several days. Available by prescription only.

Ask your doctor about multi-symptom FLONASE, or call 1-800-FLONASE, or visit www.flonase.com.

gsk
GlaxoSmithKline

When you get it all, all it takes is Flonase®
(fluticasone propionate)
Nasal Spray, 50 mcg

Please see important information on the following page.

FLONASE®
(fluticasone propionate) Nasal Spray, 50 mcg

BRIEF SUMMARY

SHAKE GENTLY BEFORE USE.

For Intranasal Use Only.

The following is a brief summary only; see full prescribing information for complete product information.

CONTRAINDICATIONS: FLONASE Nasal Spray is contraindicated in patients with a hypersensitivity to any of its ingredients.

WARNINGS: The replacement of a systemic corticosteroid with a topical corticosteroid can be accompanied by signs of adrenal insufficiency, and in addition some patients may experience symptoms of withdrawal, e.g., joint and/or muscular pain, lassitude, and depression. Patients previously treated for prolonged periods with systemic corticosteroids and transferred to topical corticosteroids should be carefully monitored for acute adrenal insufficiency in response to stress. In those patients who have asthma or other clinical conditions requiring long-term systemic corticosteroid treatment, too rapid a decrease in systemic corticosteroids may cause a severe exacerbation of their symptoms.

The concomitant use of intranasal corticosteroids with other inhaled corticosteroids could increase the risk of signs or symptoms of hypercorticism and/or suppression of the HPA axis.

Patients who are on immunosuppressant drugs are more susceptible to infections than healthy individuals. Chickenpox and measles, for example, can have a more serious or even fatal course in patients on immunosuppressant doses of corticosteroids. In such patients who have not had these diseases, particular care should be taken to avoid exposure. How the dose, route, and duration of corticosteroid administration affects the risk of developing a disseminated infection is not known. The contribution of the underlying disease and/or prior corticosteroid treatment to the risk is also not known. If exposed to chickenpox, prophylaxis with varicella zoster immune globulin (VZIG) may be indicated. If exposed to measles, prophylaxis with pooled intramuscular immunoglobulin (IG) may be indicated. (See the respective package inserts for complete VZIG and IG prescribing information.) If chickenpox develops, treatment with antiviral agents may be considered.

PRECAUTIONS:

General: Rarely, immediate hypersensitivity reactions or contact dermatitis may occur after the administration of FLONASE Nasal Spray. Rare instances of wheezing, nasal septum perforation, cataracts, glaucoma, and increased intraocular pressure have been reported following the intranasal application of corticosteroids, including fluticasone propionate.

Use of excessive doses of corticosteroids may lead to signs or symptoms of hypercorticism, suppression of HPA function, and/or reduction of growth velocity in children or teenagers. Physicians should closely follow the growth of children and adolescents taking corticosteroids, by any route, and weigh the benefits of corticosteroid therapy against the possibility of growth suppression if growth appears slowed.

Although systemic effects have been minimal with recommended doses of FLONASE Nasal Spray, potential risk increases with larger doses. Therefore, larger than recommended doses of FLONASE [redacted] Spray should be avoided.

When used at higher than recommended doses, or in rare individuals at recommended doses, systemic corticosteroid effects such as hypercorticism and adrenal suppression may appear. If such changes occur, the dosage of FLONASE Nasal Spray should be discontinued slowly consistent with accepted procedures for discontinuing oral corticosteroid therapy.

In clinical studies with fluticasone propionate administered intranasally, the development of localized infections of the nose and pharynx with *Candida albicans* has occurred only rarely. When such an infection develops, it may require treatment with appropriate local therapy and discontinuation of treatment with FLONASE Nasal Spray. Patients using FLONASE Nasal Spray over several months or longer should be examined periodically for evidence of *Candida* infection or other signs of adverse effects on the nasal mucosa.

FLONASE Nasal Spray should be used with caution, if at all, in patients with active or quiescent tuberculous infection; untreated local or systemic fungal or bacterial; or systemic viral infections or parasitic infection, or ocular herpes simplex.

Because of the inhibitory effect of corticosteroids on wound healing, patients who have experienced recent nasal septal ulcers, nasal surgery, or nasal trauma should not use a nasal corticosteroid until healing has occurred.

Information for Patients: Patients being treated with FLONASE Nasal Spray should receive the following information and instructions. This information is intended to aid them in the safe and effective use of this medication. It is not a disclosure of all possible adverse or intended effects.

Patients should be warned to avoid exposure to chickenpox or measles and, if exposed, to consult their physician without delay.

Patients should use FLONASE Nasal Spray at regular intervals as directed since its effectiveness depends on its regular use. A decrease in nasal symptoms may occur as soon as 12 hours after starting therapy with FLONASE Nasal Spray. Results in several clinical trials indicate statistically significant improvement within the first day or two of treatment; however, the full benefit of FLONASE Nasal Spray may not be achieved until treatment has been administered for several days. The patient should not increase the prescribed dosage but should contact the physician if symptoms do not improve or if the condition worsens. For the proper use of the nasal spray and to attain maximum improvement, the patient should read and follow carefully the accompanying patient's instructions.

Drug Interactions: In a placebo-controlled, crossover study in eight healthy volunteers, coadministration of a single dose of orally inhaled fluticasone propionate (1000 mcg, 5 times the maximum daily intranasal dose) with multiple doses of ketoconazole (200 mg) to steady state resulted in increased mean fluticasone propionate concentrations, a reduction in plasma cortisol AUC, and no effect on urinary excretion of cortisol. This interaction may be due to an inhibition of the cytochrome P450 3A4 isoenzyme system by ketoconazole, which is also the route of metabolism of fluticasone propionate. No drug interaction studies have been conducted with FLONASE Nasal Spray; however, care should be exercised when fluticasone propionate is coadministered with long-term ketoconazole and other known cytochrome P450 3A4 inhibitors.

Carcinogenesis, Mutagenesis, Impairment of Fertility: Fluticasone propionate demonstrated no tumorigenic potential in mice at oral doses up to 1000 mcg/kg (approximately 20 times the maximum recommended daily intranasal dose in adults and approximately 10 times the maximum recommended daily intranasal dose in children on a mcg/m² basis) for 78 weeks or in rats at inhalation doses up to 57 mcg/kg (approximately 2 times the maximum recommended daily intranasal dose in adults and approximately equivalent to the maximum recommended daily intranasal dose in children on a mcg/m² basis) for 104 weeks.

Fluticasone propionate did not induce gene mutation in prokaryotic or eukaryotic cells in vitro. No significant clastogenic effect was seen in cultured human peripheral lymphocytes in vitro or in the mouse micronucleus test when administered at high doses by the oral or subcutaneous routes. Furthermore, the compound did not delay erythroblast division in bone marrow.

No evidence of impairment of fertility was observed in reproductive studies conducted in male and female rats at subcutaneous doses up to 50 mcg/kg (approximately 2 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis). Prostate weight was significantly reduced at a subcutaneous dose of 50 mcg/kg.

Pregnancy: ***Teratogenic Effects:*** Pregnancy Category C. Subcutaneous studies in the mouse and rat at 45 and 100 mcg/kg, respectively (approximately equivalent to and 4 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis, respectively) revealed fetal toxicity characteristic of potent corticosteroid compounds, including embryonic growth retardation, omphalocele, cleft palate, and retarded cranial ossification.

In the rabbit, fetal weight reduction and cleft palate were observed at a subcutaneous dose of 4 mcg/kg (less than the maximum recommended daily intranasal dose in adults on a mcg/m² basis).

However, no teratogenic effects were reported at oral doses up to 300 mcg/kg (approximately 25 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis) of fluticasone propionate to the rabbit. No fluticasone propionate was detected in the plasma in this study, consistent with the established low bioavailability following oral administration (see CLINICAL PHARMACOLOGY section of full prescribing information).

Fluticasone propionate crossed the placenta following oral administration of 100 mcg/kg to rats or 300 mcg/kg to rabbits (approximately 8 and 25 times, respectively, the maximum recommended daily intranasal dose in adults on a mcg/m² basis).

There are no adequate and well-controlled studies in pregnant women. Fluticasone propionate [redacted] be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Experience with oral [redacted] since their introduction in pharmacologic, as opposed to physiologic, doses suggests that rodents are more prone to teratogenic effects from corticosteroids than humans. In addition, because there is a natural increase in corticosteroid production during pregnancy, most women will require a lower exogenous corticosteroid dose and many will not need corticosteroid treatment during pregnancy.

Nursing Mothers: It is not known whether fluticasone propionate is excreted in human breast milk. When tritiated fluticasone propionate was administered to rats at a subcutaneous dose of 10 mcg/kg (less than the maximum recommended daily intranasal dose in adults on a mcg/m² basis), radioactivity was excreted in the milk. Because other corticosteroids are excreted in human milk, caution should be exercised when FLONASE Nasal Spray is administered to a nursing woman.

Pediatric Use: Five hundred (500) patients aged 4 to 11 years of age and 440 patients aged 12 to 17 years were studied in US clinical trials with fluticasone propionate nasal spray. The safety and effectiveness of FLONASE Nasal Spray in children below 4 years of age have not been established.

Oral and, to a less clear extent, inhaled and intranasal corticosteroids have been shown to have the potential to cause a reduction in growth velocity in children and adolescents with extended use. If a child or adolescent on any corticosteroid appears to have growth suppression, the possibility that they are particularly sensitive to this effect of corticosteroids should be considered (see PRECAUTIONS).

Geriatric Use: A limited number of patients above [redacted] years of age (n =275) have been treated with FLONASE Nasal Spray in US and non-US clinical trials. While the number of patients is too small to permit separate analysis of efficacy and safety, the adverse reactions reported in this population were similar to those reported by younger patients.

ADVERSE REACTIONS: In controlled US studies, more than 3300 patients with seasonal allergic, perennial allergic, or perennial nonallergic rhinitis received treatment with intranasal fluticasone propionate. In general, adverse reactions in clinical studies have been primarily associated with irritation of the nasal mucous membranes, and the adverse reactions were reported with approximately the same frequency by patients treated with the vehicle itself. The complaints did not usually interfere with treatment. Less than 2% of patients in clinical trials discontinued because of adverse events; this rate was similar for vehicle placebo and active comparators.

Systemic corticosteroid side effects were not reported during controlled clinical studies up to [redacted] months' duration with FLONASE Nasal Spray. If recommended doses are exceeded, however, or if individuals are particularly sensitive, or taking FLONASE Nasal Spray in conjunction with administration of other corticosteroids, symptoms of hypercorticism, e.g., Cushing's syndrome, could occur.

The following incidence of common adverse reactions (>3%, where incidence in fluticasone propionate-treated subjects exceeded placebo) is based upon seven controlled clinical trials in which 536 patients (57 girls and 108 boys aged 4 to 11 years, 137 female and 234 male adolescents and adults) were treated with FLONASE Nasal Spray 200 mcg once daily over 2 to 4 weeks and two controlled clinical trials in which 246 patients (119 female and 127 male adolescents and adults) were treated with FLONASE Nasal Spray 200 mcg once daily over 6 months. Also included in the table are adverse events from two studies in which 167 children (45 girls and 122 boys aged 4 to 11 years) were treated with FLONASE Nasal Spray 100 mcg once daily for 2 to [redacted] weeks.

Overall Adverse Experiences With >3% Incidence on Fluticasone Propionate in Controlled Clinical Trials With FLONASE Nasal Spray in Patients ≥4 Years With Seasonal or Perennial Allergic Rhinitis

	Vehicle Placebo (n=758) %	FLONASE 100 mcg Once Daily (n=167) %	FLONASE 200 mcg Once Daily (n=782) %
Headache	14.6	6.6	16.1
Pharyngitis	7.2	6.0	7.8
Epistaxis	5.4	6.0	6.9
Nasal burning/ nasal irritation	2.6	2.4	3.2
Nausea/vomiting	2.0	4.8	2.6
Asthma symptoms	2.9	7.2	3.3
Cough	2.8	3.6	3.8

Other adverse events that occurred in ≤3% but ≥1% of patients and that were more common with fluticasone propionate (with uncertain relationship to treatment) included: blood in nasal mucus, runny nose, abdominal pain, diarrhea, fever, flu-like symptoms, aches and pains, dizziness, bronchitis.

Observed During Clinical Practice: In addition to adverse events reported from clinical trials, the following events have been identified during postapproval use of fluticasone propionate in clinical practice. Because they are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. These events have been chosen for inclusion due to either their seriousness, frequency of reporting, causal connection to fluticasone propionate, occurrence during clinical trials, or a combination of these factors.

General: Hypersensitivity reactions, including angioedema, skin rash, edema of the face and tongue, pruritus, urticaria, bronchospasm, wheezing, dyspnea, and anaphylaxis/anaphylactoid reactions, which in rare instances were severe.

Ear, Nose, and Throat: Alteration or loss of sense of taste and/or smell and, rarely, nasal septal perforation, nasal ulcer, sore throat, throat irritation and dryness, cough, hoarseness, and voice changes.

Eye: Dryness and irritation, conjunctivitis, blurred vision, glaucoma, increased intraocular pressure, and cataracts.

OVERDOSAGE: Chronic overdosage with FLONASE Nasal Spray may result in signs/symptoms of hypercorticism (see PRECAUTIONS). Intranasal administration of 2 mg (10 times the recommended dose) of fluticasone propionate twice daily for 7 days to healthy human volunteers was well tolerated. Single oral doses up to 16 mg have been studied in human volunteers with no acute toxic effects reported. Repeat oral doses up to 80 mg daily for 10 days in volunteers and repeat oral doses up to 10 mg daily for 14 days in patients were well tolerated. Adverse reactions were of mild or moderate severity, and incidences were similar in active and placebo treatment groups. Acute overdosage with this dosage form is unlikely since one bottle of FLONASE Nasal Spray contains approximately 8 mg of fluticasone propionate.

The oral and subcutaneous median lethal doses in mice and rats were >1000 mg/kg (>20000 and >41000 times, respectively, the maximum recommended daily intranasal dose in adults and >10000 and >20000 times, respectively, the maximum recommended daily intranasal dose in children on a mg/m² basis).

GlaxoWellcome

Glaxo Wellcome Inc.
Research Triangle Park, NC 27709

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AT THE NATIONAL GEOGRAPHIC SOCIETY

BOTH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER MARK THIESSEN

Life on the Front Lines

Photographing wildland firefighters at work

Attending "fire school" in the Boise National Forest, staff photographer Mark Thiessen heard teacher Norbert Schuster tell a heart-wrenching story: how a young fellow firefighter was killed by a falling tree seconds after he passed her on the fire line. Last year Mark, who has traveled to Idaho for the past five years to document the lives and times of professional wildland firefighters, joined with Jim Webb, a content developer for our website, to create a multimedia account of Schuster's tale *(www.nationalgeographic.com/firecall)*. It won "best of show" in the 2000 Omni Intermedia Awards competition.

Mark went to fire school so that he could join crews on the front lines. "I don't fight fires; I just take pictures," he says. "But I'm right there. I want to tell about these people as individuals. My goal is to do something that firefighters would look at and say, 'Yeah, you got it right!' And so they can have something to show their loved ones to help them understand what they go through." The National Geographic Channel will feature Mark and his project in an episode of a planned new series called "Out There."

100 YEARS AGO

August 1901

"Asia must be held at once the cradle of humanity, the birthplace of nations, the nursery of the world's religions; and all right-thinking men must hope that the debt of the western world to the queenly continent will be paid in full measure."

—From "Asia, the Cradle of Humanity," by W J McGee

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Swimming in Awards

These playful sea lions (above) might just be celebrating our triumphs in the University of Missouri's 58th Annual Pictures of the Year Competition. They appeared in a retrospective of David Doubilet's work that earned Illustrations editor Kathy Moran a first place for picture story/editing—one of 31 awards we won. Among those the prize for best use of photography in magazines.

Jon Olson took second place in the magazine photographer of the year competition, and Michael Nichols took third, as well as firsts for issue reporting and science/natural history picture story. Doubilet won top prize for science/natural history photographs, ahead of images by Nichols and Chris Mark Hunter took second prize for science/natural history picture story, and Jodi Cobb earned a second in

DAVID DOUBILET

JODI COBB, NGS

portraits, plus an award of excellence for her Huli warrior image (above). Bert Fox portfolio took a third place in picture editing and Sarah Leen, Sisse Brimberg, Steve McCurry, Reza, and illustrations editor Kurt Mutchler also won awards of excellence.

MARK THIESSEN

Around the World

It's too good to be true, Karim Sadjadpour thought when he won an $8,500 grant from the Circumnavigators Club to circle the globe for three months. After graduating from the University of Michigan in 1999, Karim used the grant to study the Internet's impact on global communication. He is now an associate producer for our website.

MORE INFORMATION

Call: 1-800-NGS-LINE
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Take a Step Toward Better Health in Our National Parks

Our national parks are not only breathtaking places to visit, but also some of the best places in which to take a walk. An invigorating walk is exactly the kind of physical activity you can enjoy regularly when you are in good health and your arthritis is in control. Read on to discover how to develop your own personal walking routine, including how walking can help you manage your arthritis pain and why our national parks are ideal for walking.

You'll also learn how the Arthritis Foundation can provide you with additional information to help you take control of your arthritis so you can enjoy a walk in the park, in your neighborhood, or anywhere.

ARTHRITIS FOUNDATION®
Take Control. We Can Help.™

A Message From the Arthritis Foundation

Take Steps ■ Take Control

Living with arthritis isn't about limiting yourself, but rather about taking control and empowering yourself to find ways to maintain your high quality of life. If you're one of the 43 million Americans with arthritis, you can take charge of your condition and continue to enjoy your favorite activities, such as walking.

Read on to find out why walking is one of the most beneficial aerobic exercises for individuals with arthritis. Talk to your doctor before starting any exercise program, and for more information about walking and arthritis, contact the Arthritis Foundation.

With 150 local offices across America, the Arthritis Foundation is the only national not-for-profit organization helping people take greater control of arthritis by leading efforts to prevent, control, and cure arthritis and related diseases.

Call the Arthritis Foundation toll-free at 1-800-283-7800 or visit www.arthritis.org for ■ free Arthritis Answers brochure.

ARTHRITIS FOUNDATION®
Take Control. We Can Help.™

Making strides

Regular exercise is essential to good health, and walking for exercise in places like our national parks is a great way to make working out a pleasure. To determine how you should incorporate exercise into your daily routine, open a dialogue with your doctor about walking. Here ■ some of the ways walking can benefit you:

- *Strengthens muscles and builds flexibility to help ease arthritis symptoms*
- *Improves cardiovascular fitness to help reduce the risk of heart disease and stroke*
- *Keeps bones strong to help prevent osteoporosis*
- *Improves your body's use of insulin to help prevent diabetes*
- *Burns calories to help you manage your weight*
- *Helps reduce stress and anxiety*
- *Boosts your energy and helps improve your mood*

A step toward easing arthritis pain

Osteoarthritis, the most common form of arthritis, occurs when cartilage protecting the ends of the bones in your joints breaks down over time, from injury, or due to other factors. When this happens, your bones may rub against each other at your joints, producing pain, inflammation, and stiffness. If you have arthritis, you may be hesitant to work out, but activities such as walking can actually help prevent or ease arthritis symptoms.

To help support your joints, exercise to build and maintain strong muscles around them. Walking can help reduce the inflammation in joints. Walking can also help you lose weight, and if you have arthritis, losing weight can help reduce the force absorbed by your joints. Ask your doctor how you can best utilize ■ walking routine to help manage or prevent arthritis. Call 1-800-283-7800 or visit www.arthritis.org for ■ free brochure on Walking and Arthritis.

A walk in the park

One of the benefits of walking is that you can share the activity with others. Take a walking trip to a national park with family or friends, or join a walking group in your community and plan a trip to ■ national park together.

Where mountains

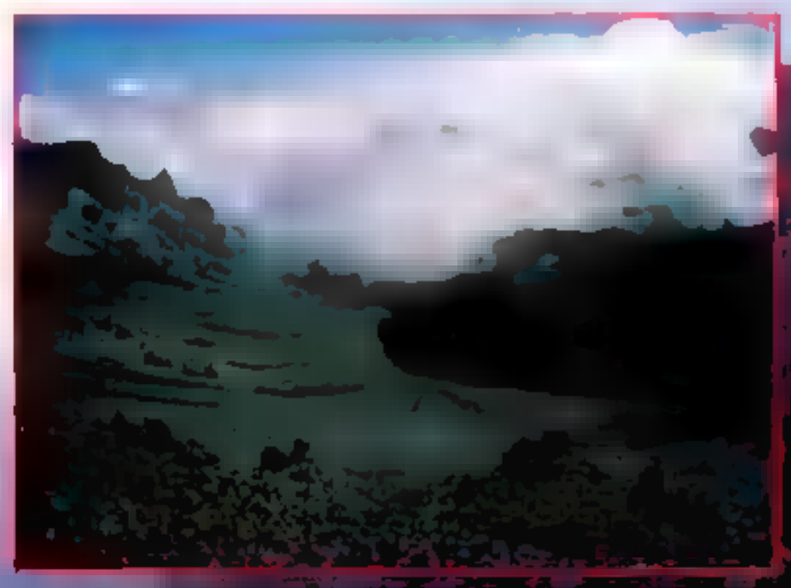
Walk Acadia's [illegible] and you'll think you've visited a dozen different parks. Coastal forests [illegible] pounding surf and silent ponds. Heathery brambles and the East Coast's highest mountain. One hundred breezy miles of nature trails and 45 miles of vehicle-free roads also include these two treasures:

Acadia National Park

Bald eagles and ospreys soar overhead as Maine's forested slopes tumble into granite cliffs battered by the relentless Atlantic.

■ *The Shore Path* A walk to Otter Point is a classic Maine experience—the tang of salt air tickling your nose, ocean spray misting your face, the thundering Atlantic in your ears, and a dramatic eastern rocky coastline, bending lighthouses, and crashing surf.

■ *Hadlock Brook Loop* Unlike any "trail" or "path" you've trekked before, this loop is actually a stone road originally designed for horse-drawn carriages in 1917. You'll pass hand-hewn granite bridges and a 60-foot waterfall, and be serenaded by the haunting call of loons.



Haleakala National Park

Looming 10,000 feet above lush Hawaiian rain forests, Maui's giant volcano lures you inside a crater of multicolored lava, ash, and rock.

[illegible] to the surface of the moon

Hiking across the Haleakala (House of the Sun) crater may remind you more of another planet than another park. Thirty-two miles of trails cross the crater floor, offering eerie views of huge volcanic vents and peaks, plus the imposing rim—first hidden, then revealed, by darting ribbons of mist and fog.

■ *Sliding Sands Trail* Descending into the moonscape and across the crater floor, this trail traverses a stark volcanic desert of cinder and sand.

■ *Walk to the Kalahaku Overlook*

A world away from volcanic dust, the park is also home to tropical jungles teeming with some of the planet's rarest birds and plants. Explore trails past dense vegetation and [illegible] as it builds to the plunge of a 400-foot waterfall.

If the shoe fits

Another reason walking is an ideal exercise for almost anyone is that you don't need a lot of equipment. A good pair of well-fitting walking shoes is essential. Choose shoes made specifically for walking to help keep you injury-free. Shoes designated by the manufacturer for walking are designed to provide support and cushioning based on the body mechanics at work while you walk. Keep these tips in mind when looking for [redacted] walking shoes:

- *Shop at the end of the day—a time when your feet tend to be largest.*
- *A good fit is essential. Even if you think you know your shoe size, have your feet measured to get the shoe that fits best. The wrong size shoes can injure your feet. Your heel shouldn't slip when you step, and there should be at least about a finger's width of space between your longest toe and the tip of your shoe (measured when standing).*
- *Wear the socks you use for walking when shopping for a new pair of walking shoes. Thick socks can affect your shoe size. Socks can provide extra padding for your feet as well as take sweat off your feet. You may have to experiment with different types of socks—cotton, synthetic, or blends—to find the ones that feel most comfortable when you walk.*
- *Be sure to try on both shoes at once and "test drive" them by briefly walking around the store.*
- *Find a knowledgeable shoe salesperson to help you select the shoe that's right for you. Ask questions, and share information about where you go walking and how often you walk. Make sure you're completely satisfied before you buy.*

Gear to go, head to toe

While you're trying to make your feet happy with the perfect walking shoes, don't forget the rest of your body. Let the weather dictate what you wear when you walk rather than fashion trends.

- *If it's warm outside, shorts and a T-shirt are fine. Choose materials for shorts and T-shirts that feel comfortable, breathe well, and take sweat away from your body. Also, make sure the shorts and T-shirt fit well. Shorts should let you move freely and shouldn't bind when you walk.*
- *When it's cool outside, wear sweatpants or stretch pants for walking instead of just shorts. Wear a light jacket over a long-sleeved T-shirt or turtleneck to help stay warm. Layering your clothing helps insulate heat and regulate your body temperature. You can remove or add layers to adjust to the conditions of your body and the weather. Make sure your outer layer of clothing protects you from the elements such as wind and rain. Don't forget gloves to keep your hands warm.*
- *When the sun is out, wear a hat with a visor to help protect your face, and sunglasses to protect your eyes. Don't forget sunscreen for exposed body parts.*

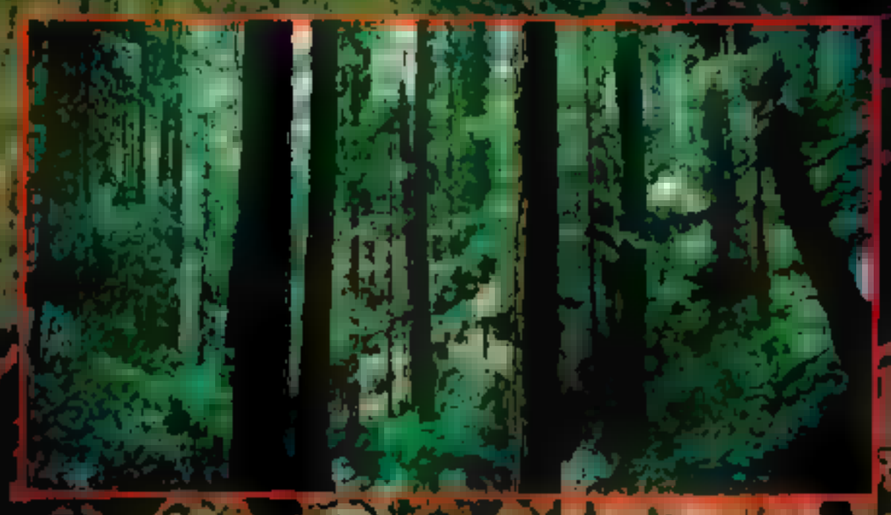
Visit the *PREVENTION* Walking Club at
www.walkingfit.com

On the American Trail

Go to ***www.nationalgeographic.com/walkingtours*** where you can follow one of 16 National Millennium Trails or create your own personal trail finder from over 2000 more trails.

Redwood National Park

This enchanted forest on Northern California's coast is home to the tallest living things on earth—trees that have seen two thousand years.



Walk with giants

Standing below them, you feel a wave of disbelief. Trees higher than the Statue of Liberty, sprung from seeds two millennia ago—can this really be? But wandering the soft paths of Redwood National Park—surrounded by cool air and 100 different kinds of mosses—is a singularly peaceful experience. Whether you seek a stroll or a challenge, no trail here will disappoint.

- *Lady Bird Johnson Grove.* This mile-long trail is thick with ferns and flecks of sunlight streaming through the towering branches above. One of nature's creations—redwood sorrel, yet still living giant redwood.

- *Tall Trees Grove.* Aptly named, this steep, difficult trail climbs the path of Redwood Creek through pink rhododendrons and ferns to the Mother Tree—365 feet tall and 900 to 1,000 years old.

Grand Canyon National Park

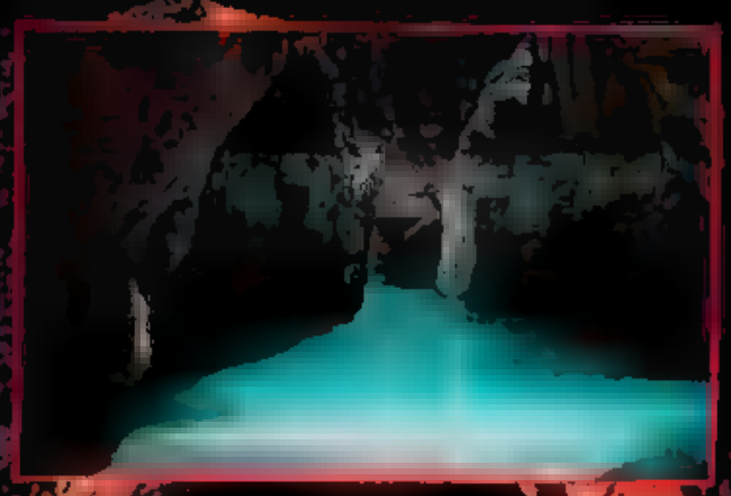
Canyons, buttes, gorges, plateaus—the language of the West unfolds before your eyes, revealing the world on a brand new scale.

Living proof of nature's

A fantastic mile-deep gash in the earth, Arizona's incomparable Grand Canyon spans 18 miles wide, making to show even a fraction of its size in any one view. Step onto a trail and become part of the landscape.

- *The South Rim Trail*

Clinging to the Canyon's edge, this unforgettable trail threads its way past breathtaking views and ever-changing colors—now then russet then golden then gold. Watch sunrise and sunset from Hopi Point, a promontory reaching deep into the gorge. Pass a sheer cliff plunging 1,000 feet to a plateau below. Overlook the sparkling Colorado River echoing with the roar of distant waterfalls.



Visit the park's IMAX theater for a breathtaking journey through the Canyon on film.

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You take VIOXX only once a day. Just one little pill can relieve your pain all day and all night for a full 24 hours.

VIOXX EFFECTIVELY REDUCED PAIN AND STIFFNESS.

In clinical studies, usually VIOXX significantly reduced pain and stiffness. So VIOXX can help make it easier for you to do the things you want to do. Like getting out for an early morning walk with a friend.

TAKE WITH OR WITHOUT FOOD.

VIOXX doesn't need to be taken with food. So, you don't have to worry about scheduling VIOXX around meals.

IMPORTANT INFORMATION ABOUT VIOXX.

In rare cases, serious stomach problems, such as bleeding, can occur without warning. People with allergic reactions such as asthma to aspirin or other arthritis medicines should not take VIOXX.

Tell your doctor if you have liver or kidney problems, or are pregnant. Also, VIOXX should not be used by women in late pregnancy.

VIOXX has been extensively studied in large clinical trials. Commonly reported side effects included upper respiratory infection, diarrhea, nausea and high blood pressure. Report any unusual symptoms to your doctor.

ASK YOUR DOCTOR OR HEALTHCARE PROFESSIONAL ABOUT VIOXX.

Call 1-800-21-MERCK for more information, or visit www.vioxx.com. Please see important additional information on the next page.

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FOR EVERYDAY VICTORIES.

Patient Information about
VIOXX® (rofecoxib tablets and oral suspension)
VIOXX® (pronounced "VI-ox")
for Osteoarthritis and Pain
Generic name: rofecoxib ("ro-fe-COX-ib")

9183902

You should read this information before you start taking VIOXX®. Also, read the leaflet each time you refill your prescription, in case any information has changed. This leaflet provides only a summary of certain information about VIOXX. Your doctor or pharmacist can give you an additional leaflet that is written for health professionals that contains more complete information. This leaflet does not take the place of careful discussions with your doctor. You and your doctor should discuss VIOXX when you start taking your medicine and at regular checkups.

What is VIOXX?

VIOXX is a nonsteroidal anti-inflammatory drug (NSAID) that is used to reduce pain and inflammation (swelling and soreness). VIOXX is available as a tablet or a liquid that you take by mouth.

VIOXX is a medicine for:
- relief of osteoarthritis (the arthritis caused by age-related "wear and tear" on bones and joints)
- management of acute pain in adults (like the short-term pain you can get after a dental or surgical operation)
- treatment of menstrual pain (pain during women's monthly periods).

Who should not take VIOXX?

Do not take VIOXX if you:
- have had an allergic reaction such as asthma attacks, hives, or swelling of the throat and face to aspirin or other NSAIDs (for example, ibuprofen and naproxen).
- have had an allergic reaction to rofecoxib, which is the active ingredient of VIOXX, or to any of its inactive ingredients. (See Inactive Ingredients at the end of this leaflet.)

What should I tell my doctor before and during treatment with VIOXX?

Tell your doctor if you are:
- pregnant or plan to become pregnant. VIOXX should not be used in late pregnancy because it may harm the fetus.
- breast-feeding or plan to breast-feed. It is not known whether VIOXX is passed through to human breast milk and what its effects could be on a nursing child.

Tell your doctor if you have:
- kidney disease
- liver disease
- heart failure
- high blood pressure
- had an allergic reaction to aspirin or other NSAIDs
- had a serious stomach problem in the past.

Tell your doctor about:
- any other medical problems or allergies you have now or have had.
- medicines that you are taking or plan to take, even those you can get without a prescription.

Tell your doctor if you develop:
- ulcer or bleeding symptoms (for instance, stomach burning or black stools, which are signs of possible stomach bleeding).
- unexplained weight gain or swelling of the feet and/or legs.
- skin rash or allergic reactions. If you have a severe allergic reaction, get medical help right away.

How should I take VIOXX?

VIOXX should be taken once a day. Your doctor will decide what dose of VIOXX you should take and how long you should take it. You may take VIOXX with or without food.

Can I take VIOXX with other medicines?

Tell your doctor about all of the other medicines you are taking or plan to take while you are on VIOXX, even other medicines that you can get without a prescription. Your doctor may want to check that your medicines are working properly together if you are taking other medicines such as
- methotrexate (a medicine used to suppress the immune system)
- warfarin (a blood thinner)
- rifampin (an antibiotic)
- ACE inhibitors (medicines used for high blood pressure and heart failure)
- lithium (a medicine used to treat a certain type of depression).

What are the possible side effects of VIOXX?

Serious but rare side effects that have been reported in patients taking VIOXX and/or related medicines have included:

- Serious stomach problems, such as stomach and intestinal bleeding, can occur with or without warning symptoms. These problems, if severe, could lead to hospitalization or death. Although this happens rarely, you should watch for signs that you may have this serious side effect and tell your doctor right away.

- Serious allergic reactions including swelling of the face, lips, tongue, and/or throat which may cause difficulty breathing or swallowing occur rarely but may require treatment right away. Severe skin reactions have also been reported.

- Serious kidney problems occur rarely, including acute kidney failure and worsening of chronic kidney failure.

- Severe liver problems, including hepatitis and jaundice, occur rarely in patients taking NSAIDs, including VIOXX. Tell your doctor if you develop symptoms of liver problems. These include nausea, tiredness, itching, tenderness in the right upper abdomen, and flu-like symptoms.

In addition, the following side effects have been reported: confusion, hair loss, hallucinations, low blood cell counts, unusual headache with stiff neck (aseptic meningitis).

More common, but less serious side effects reported with VIOXX have included the following:

Upper and/or lower respiratory infection and/or inflammation
Headache
Dizziness
Diarrhea
Nausea and/or vomiting
Heartburn, stomach pain and upset
Swelling of the legs and/or feet
High blood pressure
Back pain
Tiredness
Urinary tract infection.

These side effects were reported in at least 2% of osteoarthritis patients receiving daily doses of VIOXX 12.5 mg to 25 mg in clinical studies.

The side effects described above do not include all of the side effects reported with VIOXX. Do not rely on this leaflet alone for information about side effects. Your doctor or pharmacist can discuss with you a more complete list of side effects. Any time you have a medical problem you think may be related to VIOXX, talk to your doctor.

What else can I do to help manage my osteoarthritis pain?

Talk to your doctor about:
- Exercise
- Controlling your weight
- Hot and cold treatments
- Using support devices.

What else should I know about VIOXX?

This leaflet provides a summary of certain information about VIOXX. If you have any questions or concerns about VIOXX, osteoarthritis or pain, talk to your health professional. Your pharmacist can give you an additional leaflet that is written for health professionals.

Do not share VIOXX with anyone else; it was prescribed only for you. It should be taken only for the condition for which it was prescribed.

Keep VIOXX and all medicines out of the reach of children.

Inactive Ingredients:

Oral suspension: citric acid (monohydrate), sodium citrate (dihydrate), sorbitol solution, strawberry flavor, xanthan gum, sodium methylparaben, sodium propylparaben.

Tablets: croscarmellose sodium, hydroxypropyl cellulose, lactose, magnesium stearate, microcrystalline cellulose, and yellow ferric oxide.

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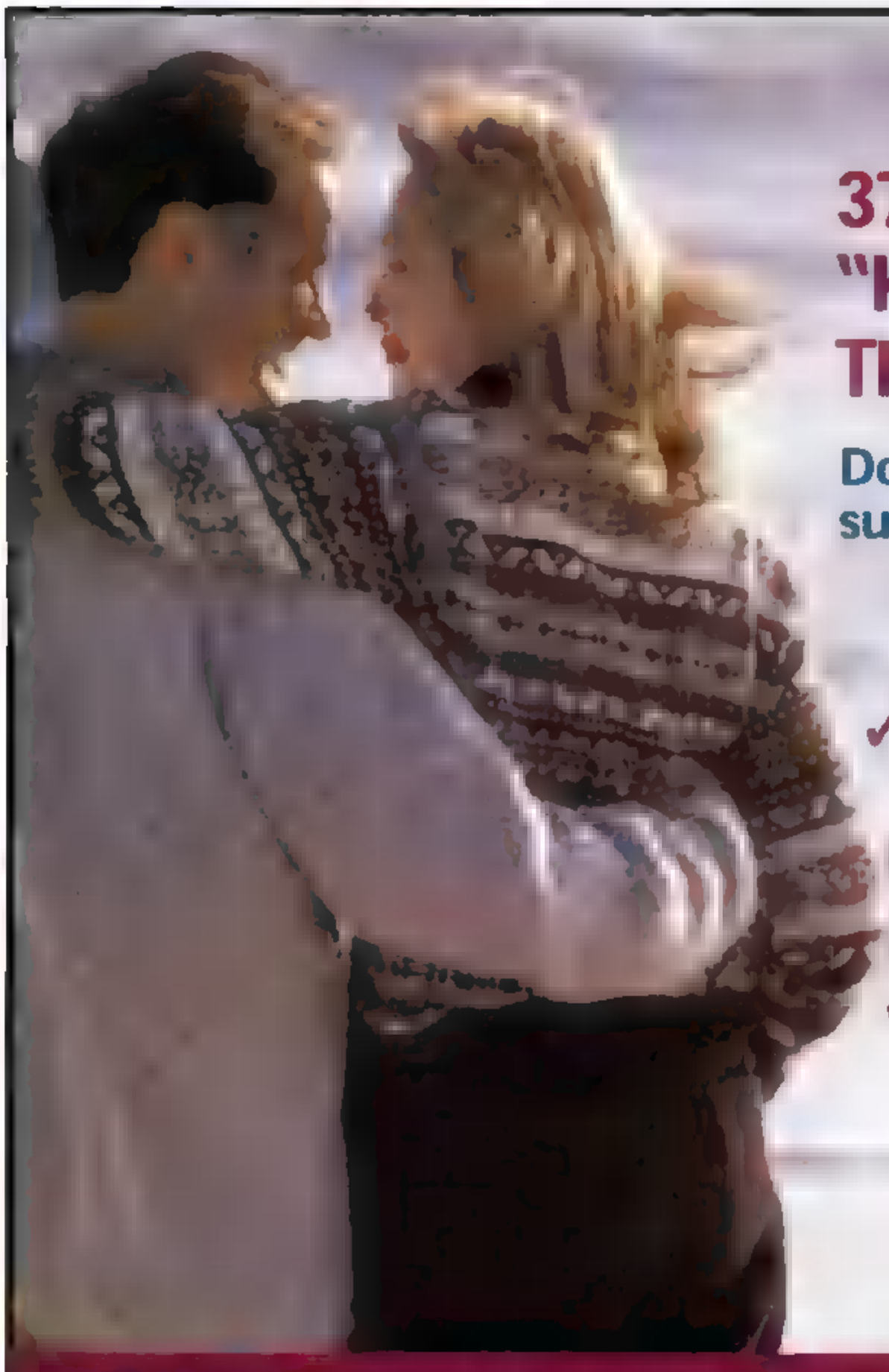

37 Things People "Know" About Wills That Aren't Really So.

Do you KNOW the answers to such questions as these?

- ✓How is property distributed when people die without wills?
- ✓Do married couples who own property together need separate wills?
- ✓If a person doesn't have a lot of money, is a will necessary?
- ✓Are laws on wills pretty much alike throughout the 50 states?
- ✓Do people without dependents need wills?

For answers to these and many other questions you may have about wills, we would like to send you our free booklet, *37 Things People "Know" About Wills That Aren't Really So.*

Fill out this form and mail to: Arthritis Foundation, Planned Giving Department, P.O. Box 7669, Atlanta, GA 30357-0669. You can also email us at **rjohnson@arthritis.org**

- ❍ Please send "37 Things People "Know" About Wills That Aren't Really So."
- ❍ Please have an Arthritis Foundation Representative contact me to discuss how charitable estate planning can benefit me.
- ❍ I have already or am considering a gift to the Arthritis Foundation in my estate plans.

Name _____

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The mission of the Arthritis Foundation is to improve lives through leadership in the prevention, control and cure of arthritis and related diseases.

NG/2001

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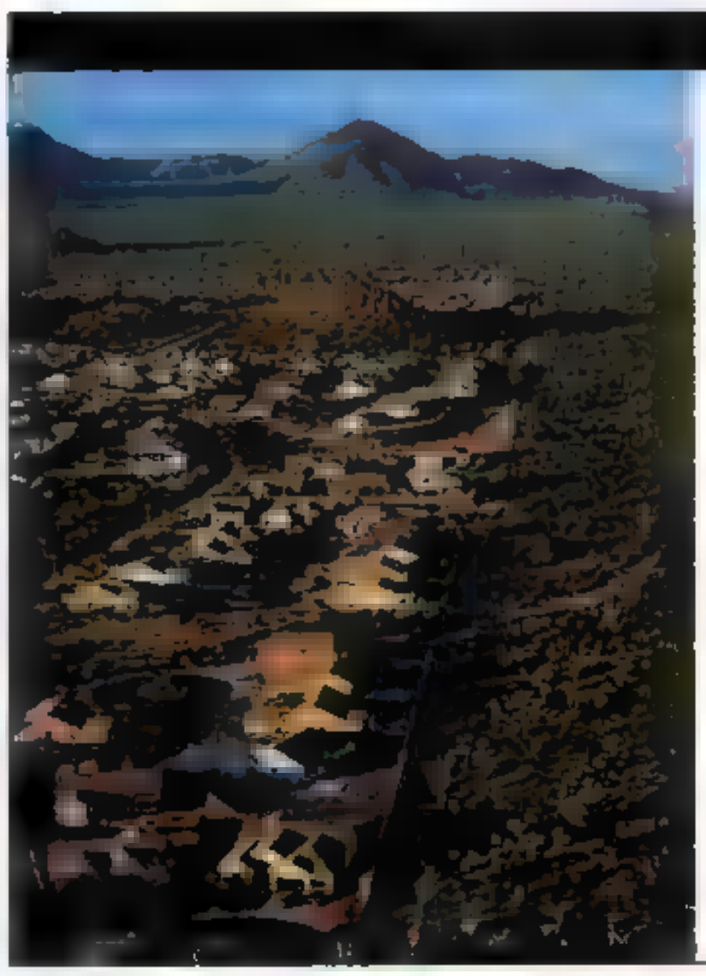
Arctic Oil?

GEORGE F.

Alaska's Arctic National Wildlife Refuge holds a treasure chest of birdlife, caribou, and crude oil. Can the oil be safely withdrawn through new drilling techniques? Should it be? See what's at stake with a map pinpointing the major issues, and then sound off in a poll and discussion board at *nationalgeographic.com/ngm/0108*



SARAH LEEN

Stopping Sprawl

Visit a virtual suburb designed to combat the spreading syndrome of clogged highways and cookie-cutter subdivisions. Here the accent is on saving open space, tightening community ties, and making commuting easier and more environmentally friendly. Judge for yourself at *nationalgeographic.com/earthpulse/sprawl*

Virtual Congo

MICHAEL NICHOLS, NGS

Immerse yourself in the heart of Africa. Forge your way through a virtual Congo River Basin and uncover video and audio from Megatransect explorer J. Michael Fay, who spent more than a year crossing central Africa on foot. Explore it yourself at *nationalgeographic.com/congotrek360*.

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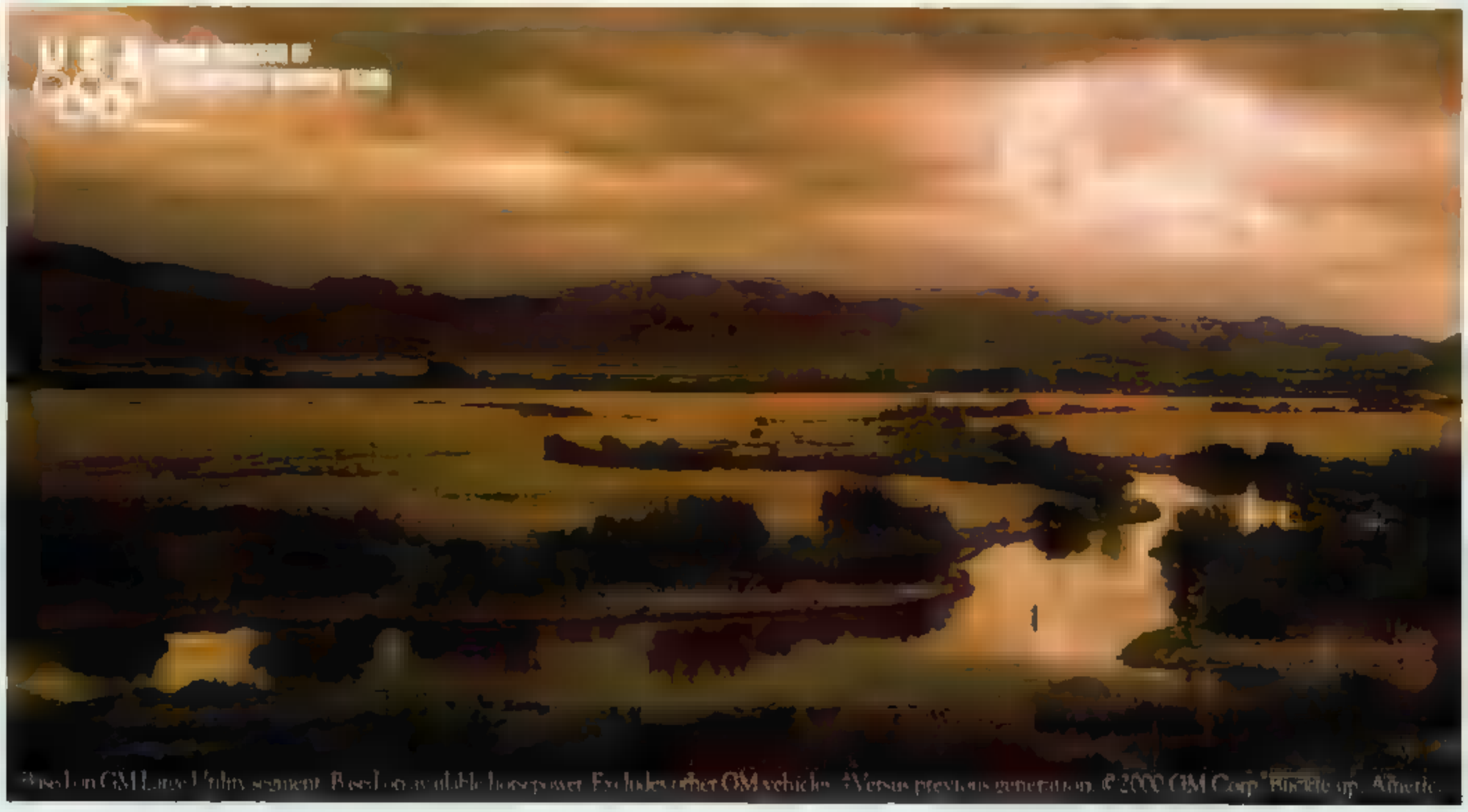

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NGS MARK THIESSEN (TOP TWO ABOVE); JAMES E. PHOTOTAKE/PICTUREQUEST

NATIONAL GEOGRAPHIC CHANNEL

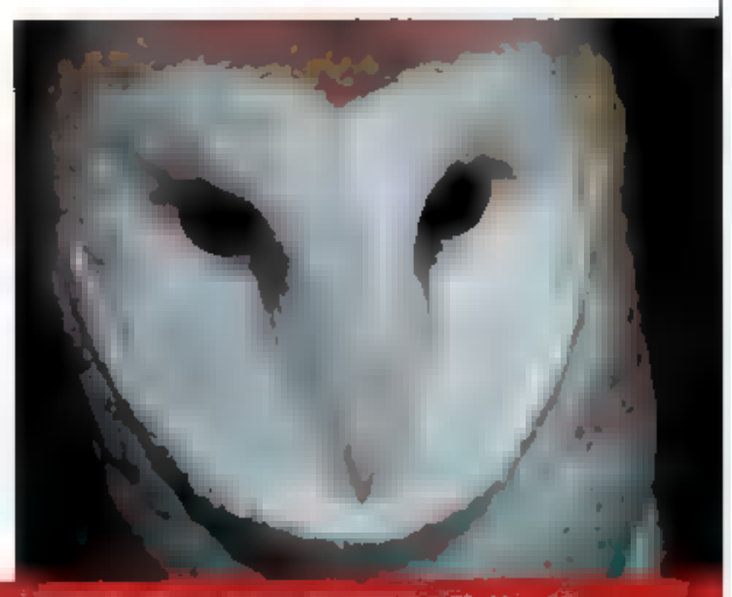
Live! From HQ

Every weekday evening at the Washington, D.C., headquarters of the National Geographic Society, at seven o'clock sharp, a glass-fronted, street-level TV studio comes to brilliant life. Co-anchors Tom Foreman and Susan Roesgen welcome viewers to *National Geographic Today*, a stimulating hour of breaking news and in-depth features about our planet. Behind the cameras a state-of-the-art control room choreographs live feeds from reporters covering events from earthquakes to discoveries of lost cities. In front of the cameras appears a distinguished cast that changes daily—world leaders, explorers, scientists, writers, and photographers. Says Channel Executive Vice President Andrew Wilk, "We have access to talent at our 'base camp' studio that gives our reporting unequaled breadth and insight."

NATIONAL GEOGRAPHIC EXPLORER, CNBC

Night Raiders

Their victims rarely see or hear them. In every setting where they thrive, from tundra to forest, owls rule the night skies. These birds, like the vigilant barn owl (right), rely on acute sight and hearing to snatch unsuspecting rodents. *Owls: Silent Hunters* follows filmmaker Fergus Beeley from Africa to Alaska to portray the lethal moves of these "masters of shadow."



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mid light

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AskUs

THE ANSWER PAGE

Our Research Correspondence staff responds to questions from curious readers.

Q When Alan Shepard hit a golf ball on the moon, did it come back to the surface, or was the moon's gravity too weak?

A In 1971 astronaut Alan Shepard, an avid golfer, hit two golf balls with a makeshift six iron he smuggled aboard the Apollo 14 mission. He joked that the ball flew "miles and miles and miles" in the moon's low gravity, one-sixth that of the Earth. Actually both shots landed in moondust less than a hundred yards away.

Q Which migratory bird travels the greatest distance?

A An arctic tern *(Sterna paradisaea)* may fly more than 18,000 miles round-trip on its overwater journey between islands north of the Arctic Circle and the shores of Antarctica. Overland, the northern wheatear *(Oenanthe oenanthe)* logs almost the same mileage flying between Alaska and Africa via Asia.

Q Is the horizontal cross on the flags of Nordic countries a Viking symbol?

A The Scandinavian cross is a Christian symbol. It first appeared in the royal arms of Danish King Valdemar IV Atterdag in the 14th century, though one legend says it fell from heaven during a 1219 battle.

Q How did the Antarctic ice sheet form?

A As Antarctica became a separate continent, the developing Circumpolar Current increasingly isolated it from warmer waters. This cooled the continent, and ice sheets began to form some 34 million years ago. The ice continued to expand and thicken, and today 98 percent of Antarctica is covered by ice more than 15,000 feet thick in some areas.

MORE INFORMATION

Send questions to **Ask Us, National Geographic Magazine, PO Box 96095, Washington, DC 20090-6095** or via the Internet to **ngsaskus@nationalgeographic.com.** Include name, address, and daytime phone number.

TELL US

Why is this man in Allahabad, India, holding his breath underground?

Think you know the answer? Go online to nationalgeographic.com/ngm/tellus/0108 and test yourself, or read it in the next month.

July Answer The drawing, part of a patent application, depicts a leather diving suit designed for the harvest of pearl-bearing oysters off the coast of Peru.

GEORGE E. MOBLEY

The Big

Open

Going Public With the Public Lands

Long the realm of ranchers and miners, the 264 million acres of public lands administered by the Bureau of Land Management are now facing a new onslaught: the rest of us. Near Moab, Utah, law-abiding citizens patrol the backcountry.

Shafts of silver, *not sunlight, lured miners into Colorado's San Juan Mountains. Their trails*

form the Alpine Loop, a BLM back country byway with more than a glimmer of mountain splendor.

Wearing a smile *and a sousaphone, Erin "Red" Thompson makes music at Burning Man, an*

annual artfest in Nevada's Black Rock Desert. "There are no spectators," says Red, "only participants."

By John G. Mitchell
SENIOR EDITOR

Photographs by Melissa Farlow

This is a story about a part of America hardly anyone knows. People who think they know from hearsay picture a bone-dry landscape puckered with sagebrush and tumbleweed. But that's not even the half of it, for there are snowcapped mountains here and lonely beaches at the edge of the sea and evergreen rain forests and meadows as bright with blossoms as a bride's bouquet. This is the part of Uncle Sam's public domain, your land and mine, that embraces a patrimony almost one-eighth the size of the United States: a quarter billion federal acres that are not under the jurisdiction of the National Park Service, the U.S. Fish and Wildlife Service, or the U.S. Forest Service—but of an understaffed, underbudgeted, underappreciated agency known by its narcoleptic initials, the BLM.

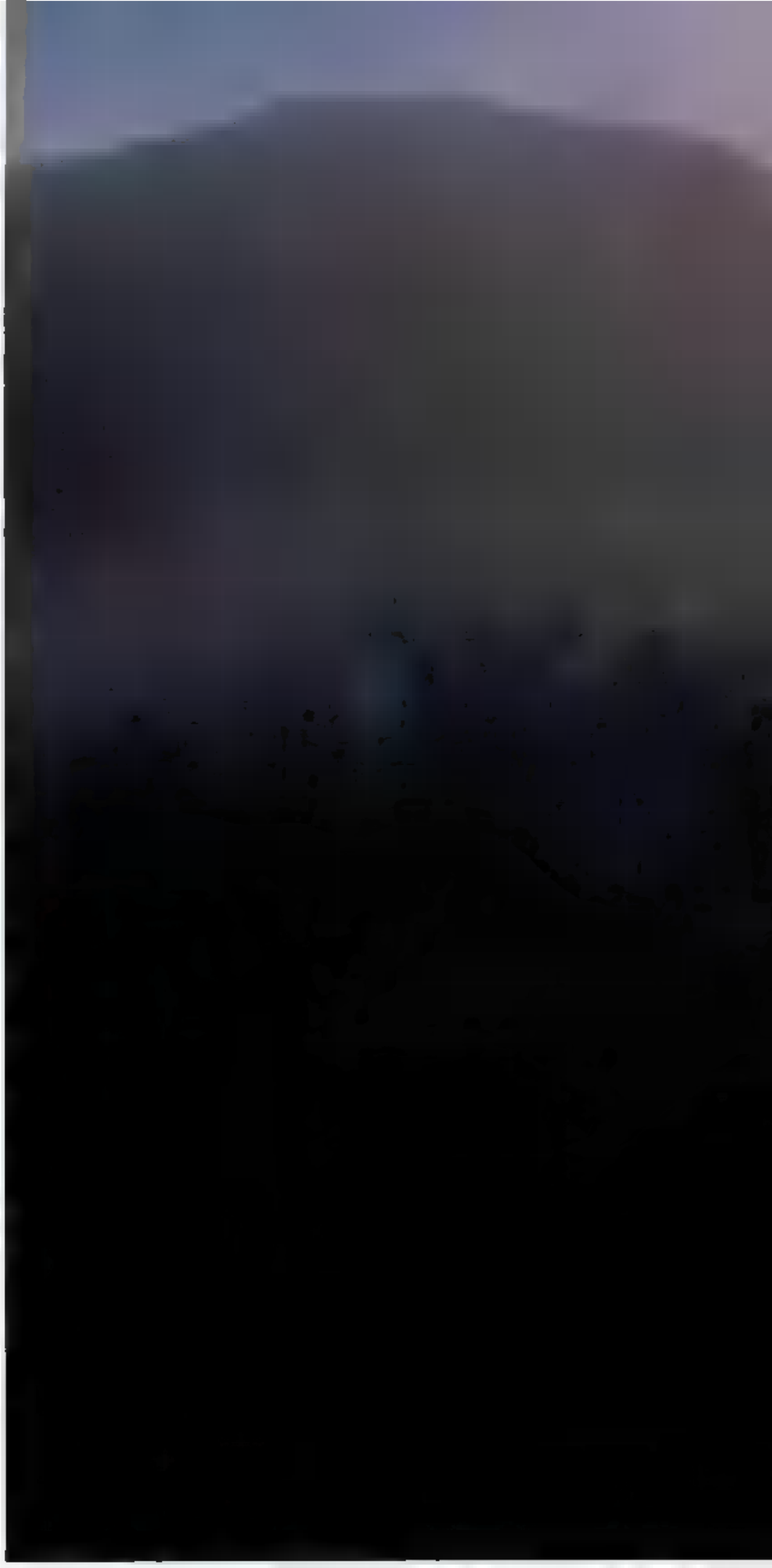
"The B-L-*what?*" I overheard a tourist ask in a Colorado restaurant last year.

"The Bureau of Land Management," her companion explained. "It's in the Department of the Interior. Some people call it the Bureau of Livestock and Mining."

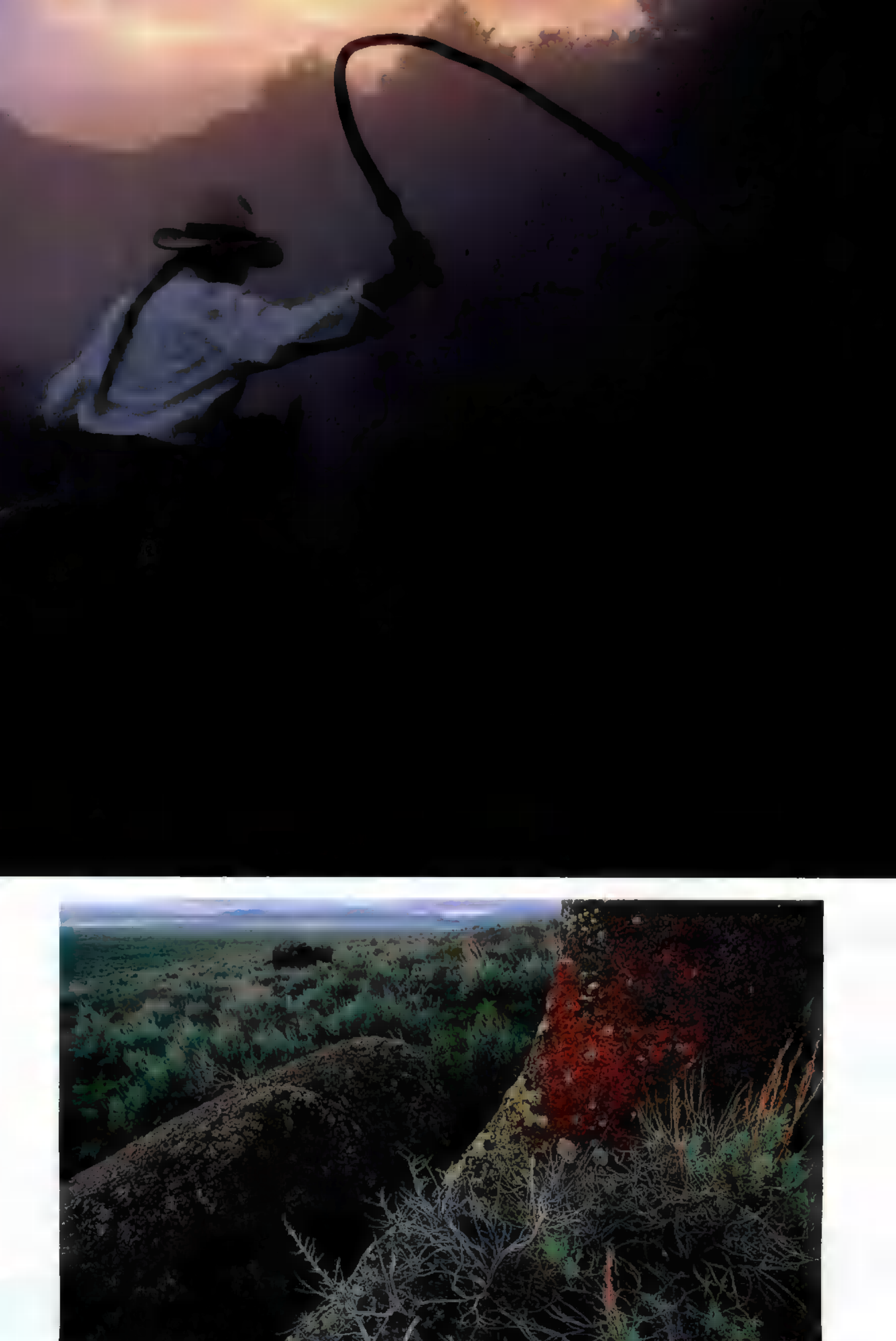
"Why?"

"Because," he said with a bit of a sneer, "that's just about all they do."

There was a time, and not so long ago at that, when licensing commerce on the public lands did appear to be the agency's primary mission; when timber sales, grazing permits, and mineral leases were administered in a user-friendly way. In recent years, however, the agency's values and priorities took a decided shift. While cattlemen and miners were still accommodated on much of the BLM's land, they could no longer count on setting the agency's full agenda, for the agency was busy learning the three R's—recreation, range restoration, and resource conservation. And some of its most spectacular or sensitive areas were declared off-limits to resource development,



Like a ghost from the past, Heidi Redd drives her cattle from winter range in Beef Basin, Utah. Sixty percent of BLM land is open to grazing amid growing concerns about the impact on ecosystems, such as sage grouse habitat (right).



"People don't know who we are. . . . And what's so ironic is that the BLM is the country's largest land manager in terms of acreage."

Sensing a trap, a wild stallion hits the brakes during a mustang roundup near Eureka, Nevada. Some 50,000 wild horses roam public lands, a legacy of Spanish explorers. To keep their numbers in check, BLM corrals as many as 10,000 a year for its wild horse adoption program.

while others were designated units of a new National Landscape Conservation System. The system was established last summer at the behest of then Interior Secretary Bruce Babbitt.

So what exactly does this made-over agency manage apart from the timber, grass, and minerals on its one-eighth of the United States? Among a variety of land and water resources, the standouts include:

- Fifteen national monuments, all but one of them designated during President Clinton's last term in office and each as physically distinct from the others as any 15 of the most popular parks in the National Park System.
- Fourteen congressionally authorized national conservation areas with inherent protections almost as tight as those of the monuments.
- One hundred forty-eight units of the National Wilderness Preservation System and more than 600 other areas under study for possible wilderness designation.
- Two thousand miles of the National Wild and Scenic Rivers System, 4,200 miles of the National Historic and Scenic Trails Systems, and 3,500 miles of scenic roads designated national back country byways.

But despite the bureau's growing reputation as a provider of recreation and protector of special areas, the agency and its lands continue to suffer from an identity problem. "People don't know who we are or what we do," says Ron Fellows, a field manager in Bakersfield, California. "And what's so ironic is that the BLM is the country's largest land manager in terms of acreage, with more habitat diversity among its holdings than any other agency in the federal government."

Overseeing a domain nearly half again as large as all the national forests and one and a half times the combined acreage of all the units of the national parks and wildlife refuge systems, the bureau nevertheless emerges as a pauper on the pages of the federal budget. While the National Park Service last fiscal year received appropriations of about $18 an acre to manage the 84 million acres under its wings, and the U.S. Fish and Wildlife Service got nearly $9 an acre for its 93 million acres, and the U.S. Forest Service spent about $7 an acre to administer its 192 million acres, the BLM had to make do managing its quarter billion acres on a shoestring of less than $3 an acre.

Not that the responsibilities of these agencies are comparable, but the difference does make one wonder whether the bureau will be allowed to pursue a new role, especially as more and more people begin to discover these

A Bureau of Landscapes and Monuments

With about an eighth of the nation's surface area in its care, the Bureau of Land Management holds the remnants of the American frontier. Along with vast expanses of western range, BLM manages a handful of wilderness areas, wild and scenic rivers, national conservation areas, and national monuments.

FEDERAL LANDS

[redacted] of the [redacted] of acres

[redacted]	264
National [redacted] Conservation [redacted]	[redacted]
[redacted] Conservation Area	14.4
National Monument	[redacted]
[redacted] units	[redacted]
[redacted] WILDLIFE [redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted] SERVICE	[redacted]
Other [redacted]	[redacted]

Scale varies in [redacted] perspective

NATIONAL GEOG[redacted]

The Land Nobody Wanted

[redacted] the first public domain was [redacted] In 1[redacted] when New York [redacted] the federal [redacted] territory between the Appalachians and the Mississippi River, [redacted] have [redacted] used, and sometimes [redacted] in the [redacted] of [redacted] the nation. From the Louisiana Purchase of [redacted] to the Alaska Purchase [redacted] 1867, [redacted] States acquired 1.8 billion acres, out [redacted] which were carved 30 [redacted] grants to [redacted] towns, [redacted] colleges; [redacted] countless homesteads of 160 acres a [redacted]. Lands that were too parched [redacted] row [redacted] too steep, or otherwise undesirable became part of the public domain. With the West now the fastest [redacted] in the [redacted] such [redacted] are undesirable no [redacted] [redacted] wildlife [redacted] recreation opportunities, and [redacted]

de facto parklands and what once could be called "the lands no one knows" inevitably become the lands that everyone covets.

OVER THE PAST COUPLE OF YEARS I was privileged to visit some of these national landscapes—to poke into the backcountry and test the edge of some wild places. In northern California I stood at the edge of the Pacific Ocean and watched the surf pound a long, sweeping crescent of black sand beach. The "lost coast" people call it because of its distance and isolation from coastal Highway 1. Behind the beach, chaparral slopes rise steeply toward summits crowned by 4,000-foot King Peak, and behind the peaks stands a rain forest of old-growth Douglas firs. This—all 60,000 acres of it—is the King Range National Conservation Area, established by Congress in 1970, the first of its kind. Here, the Lost Coast Trail will show you the way through the mountains to Hidden Valley or up the beach past Sea Lion Gulch to Punta Gorda. Start at the mouth of the Mattole River at the north and hike the entire 54-mile trail and you will have traveled California's longest unroaded coastline.

Providing outdoor recreation in scenic settings, however, isn't always the core mission of the managers of national landscapes. In some cases the goal is to preserve a biological or cultural resource. Canyons of the Ancients National Monument, a big block of southwestern Colorado bracketed by Mesa Verde National Park and Hovenweep National Monument, was set aside last year to protect its archaeological sites from artifact looting. For more than a thousand years—until about A.D. 1300—the region was inhabited by the Anasazi, ancient ancestors of the Pueblo Indians. Gary Matlock, a retired BLM archaeologist who guided me through the monument, estimates that the Anasazi at their peak in this region numbered as many as 23,000, about half the area's current population.

A third-generation native of nearby Cortez, Matlock initiated an effort 24 years ago to "save what was out here" by asking Congress to make it a national conservation area. But local residents—some fearing land-use restrictions; others, a flood of tourists—resisted the idea. "So instead of a conservation area," Matlock said, "what they got is a national monument."

As much as some Westerners may chafe at the idea of a conservation area in their backyard, the prospect of a national monument sends the politically conservative ones right up a wall. That's what happened in 1996 when President Clinton used the Antiquities Act of 1906 to establish the 1.9-million-acre Grand Staircase–Escalante National Monument in southern Utah. The act allows a President to designate monuments by executive order, without the advice and consent of Congress, and all but three in the 20th century—Presidents Nixon, Reagan, and George H. W. Bush—used that authority.

Historically, most of the monuments—Theodore Roosevelt's set-aside of the Grand Canyon in 1908, for example—were carved

Dominating the skyline north of the Grand Canyon, the Grand Wash Cliffs are now part of the million-acre Grand Canyon–Parashant National Monument, one of 15 national monuments created during the Clinton administration.

from public domain lands and then turned over to the National Park Service. But Grand Staircase–Escalante was not transferred to another federal agency, the better to ease the BLM into its new suit of clothes. After more than five years the monument's sunburnt buttes and serpentine canyons still remain under a bureau management plan that neither locks out such traditional uses as grazing and hunting nor surrenders the keys to developers.

So far, however, the Utah experience has not deflected criticism—mostly from property-rights advocates—of Bill Clinton's other monument designations. Nor has it deterred President George W. Bush and Gale Norton, his secretary of the interior, from threatening to redefine some of the previous administration's other land conservation initiatives. One recommendation would throw open millions of acres of public lands—including some monuments—to oil and gas drilling. Another would increase the agency's budget for administering fossil fuel leasing by 20 percent while allocating no new funds for recreation and conservation.

Among the most bitterly contested Clinton actions was designation of the 52,900-acre

In the mid-1930s, with dust from the overgrazed, drought-pinched plains bloodying sunsets . . . Congress approved the Taylor Grazing Act.

Managing cattle land and ecosystems isn't easy. A prescribed burn in Oregon improves grazing, while exotic forage crops compete with rare native plants in California's Carrizo Plain.

Cascade-Siskiyou National Monument in southern Oregon. The word spread that the government was planning to lock it all up and post "No Trespassing" signs—a fantasy popular among people who perceive these monuments as federal land grabs (and a curious fantasy at that, inasmuch as the government can hardly "grab" what it already owns).

The centerpiece of Cascade-Siskiyou is a forested ridge running east-west between 6,000-foot Soda Mountain and a volcanic plug called Pilot Rock, a 19th-century landmark for overland travelers on the Applegate Cutoff of the Oregon Trail. The ridge functions as a kind of bridge between the Siskiyou and Klamath Mountains in the Coast Range to the west and the Cascades inland. Four ecoregions meet here: forests of fir on the north-facing slopes, incense cedar and ponderosa pine on the south, occasional rocky balds with junipers and rabbitbrush, and finally, on the lowest slopes, Garry oak and mountain mahogany.

"This is a monument to biodiversity," said Dominick DellaSala, a forest ecologist with the World Wildlife Fund in Ashland, Oregon. We stood at the edge of a canyon just off the Pacific Crest National Scenic Trail, which skewers a length of the new monument. Dave Willis was there too. Willis is chairman of the Soda Mountain Wilderness Council. It was Willis's persistent efforts, in large part, that finally paid off in this monument designation. Now he and DellaSala were working to create another monument next door in the Siskiyou Mountains.

"The Siskiyou connection should not be underestimated," Willis said. "The Siskiyou is one of the most botanically diverse coniferous forests in the world. It's a Noah's Ark. And Soda Mountain is the loading dock. It's not the kind of place you want to turn into a playground for off-road vehicles."

AS A CONCEPT, the public domain is as old as the United States of America. Its roots go back to a time when the original Colonies ceded to the federal government some 240 million acres between the Appalachian Mountains and the Mississippi River. This was a sizable piece of real estate, and the government wasted no time devising a plan to dispose of it. The Land Ordinance of 1785 and the Northwest Ordinance of 1787 provided for the survey and settlement of public lands north of the Ohio River. By 1819, after a crash toppled prices, the General Land Office in the Treasury Department was selling public land in 80-acre units for as little as $1.25 an acre.

As the nation expanded westward, the

government became proprietor of 1.8 billion acres. In 1862 President Abraham Lincoln signed into law the Homestead Act, giving substance to his cherished dream that the Republic would settle "the wild lands into parcels so that every poor man may have a home." By 1900 homesteaders had claimed 80 million acres. Even more of the public domain went to the railroads then abuilding across the West.

But even before the 19th century shut down, there had been a shift in the winds blowing over the federal lands. It started with a national park at Yellowstone in 1872, a park cut from the public domain. By and by the federal estate would yield many more national parks and millions of acres of national forests. But when Herbert Hoover moved into the White House, his administration hatched a plan to cede all the remaining undesignated public lands to the states in which they lay. In words that would be music to the ears of some rural Westerners today, Hoover declared in 1929: "We must seek every opportunity to . . . place our communities in control of their own destinies." Shortly thereafter, Hoover's every opportunity was derailed by the Great Depression.

In the mid-1930s, with dust from the overgrazed, drought-pinched plains bloodying sunsets at Kansas City, Congress approved the Taylor Grazing Act to close most of the remaining public lands to settlement and to create grazing districts for the livestock industry under government supervision. But there wasn't much supervision during World War II; beef was essential to the war effort. Finally, in 1946, the two agencies that had shared responsibility for the public lands—the General Land Office and the Grazing Service—merged to form the Bureau of Land Management.

The new agency, however, had no clear legislative mandate as to how it should manage the land. Congress tried to fix that 30 years later with the Federal Land Policy and Management Act of 1976, which directed the BLM to manage the public lands "so that they are utilized in the combination that will best meet the present and future needs of the American people." Despite its indecisive language, that act got a reluctant bureau moving in a revolutionary direction—using land for conservation as well as commerce.

TO GET AN IDEA of how the bureau's people might be juggling that mandate, I hitched a ride last year into the new Grand Canyon–Parashant National Monument in northwestern Arizona, a place so wild, so remote, and, at ■ million acres, so

Playing on petrified dunes, *a climber hops a crack at Red Rock Canyon near Las Vegas,*

one of BLM's most visited sites. A million people chose the canyon's solitude over the slots last year.

In northern California I stood at the edge of the Pacific Ocean and watched the surf pound a long, sweeping crescent of black sand beach.

Too rugged for roads, too lovely to ignore, California's King Range was the first designated national conservation area. With plunging cliffs and towering seas, the "lost coast" draws surfers, hikers, and anglers of all ages.

backcountry big there isn't any front to it. The monument abuts the north rim of Grand Canyon National Park, takes in a piece of the Park Service's Lake Mead National Recreation Area, and incorporates four separate BLM wilderness areas, including the Grand Wash Cliffs, where a scrubby basin-and-range kind of country collides head-on with the prickly Colorado Plateau.

"It's big and wild, all right," Roger Taylor was saying as we headed down a rough, unpaved 4x4 track into the Parashant. Taylor is the bureau's field manager for the Arizona Strip, an 8,400-square-mile swatch of desert canyons and forested plateaus isolated from the rest of the state by the grand chasm of the Colorado River. If the strip were a glove, the Parashant would be one of its fingers.

There are no paved roads or visitor facilities in the monument, and none are planned. "The environmentalists will want us to close down some of these two-track jeep trails that are good for vehicular exploring," Taylor said, "and there will be others wanting them hard-topped. And some people will come here expecting to find the full services of a national park. They'll be disappointed. We want to maintain the wild character of the area."

Alan O'Neill, at the time superintendent of the Park Service's Lake Mead National Recreation Area, traveled with us through the Parashant that day and the next. He agreed with Taylor that the new monument should be managed as an unimproved wildland to protect its scientific and historic values, and not as a national park or recreation area even though one-fifth of it falls within the Park Service's Lake Mead turf. "At every level of our two organizations," O'Neill said, "there will be people resistant to the idea of making this joint monument a seamless operation. There's such a difference in our two cultures."

Later, as we bumped across the seamless boundary between BLM and Park Service land, O'Neill said: "Now you can tell we're on park land. It smells better here. It's the cliff rose."

"So?"

"Cliff rose," he bluffed, "won't grow on BLM land."

Taylor was driving. Suddenly a rocky hole in the rutted jeep trail rattled our collective teeth. "No," Taylor said, "*that* is how you can tell we're on Park Service land."

Two long days' journey gave us only one small scratch of the Parashant's variegated surface—sagebrush plains sprinkled with Mojave yucca, the Shivwits Plateau running from piñon and juniper up into ponderosa tall

"The public lands could become that Big Open that's hard to get to but easy to get lost in."

Poised for acrobatic moves, Judo Patterson works the "Mine Wave" on Oregon's Rogue River, one of 36 wild and scenic rivers managed by BLM. Nearby, the volcanic plug of Pilot Rock (right) looms over the new Cascade-Siskiyou National Monument, an ecological crossroads where two ranges collide.

enough to challenge the lightning, an aching, unforgettable view from Twin Point across Surprise and Separation Canyons to the Lower Granite Gorge of the Grand itself. I figured it might take a year of travel to see the rest of it, and a good supply of spare tires.

On the morning of the second day I rolled out of my sleeping bag before the others were up and went to the edge of a meadow where some treetop ravens were greeting the dawn with their raucous croaks. I wondered then how the bureau was going to hold the line in places like this in the years ahead; how it would manage to resist the inevitable croaks of a public demanding greater ease, security, comfort, and hands-on guidance—all the improvements that could eventually turn the National Landscape Conservation System into a second-string adjunct of the national parks.

That possibility had first occurred to me the year before on one of the BLM's unpaved back country byways near Price, Utah, along a stretch that winds past scores of ancient pictographs and other Indian rock art. A woman stood beside one of the sites with her hands on her hips, denouncing the BLM for its lack of signage. "It's awful," she said. "I'm going to complain. All these pictographs! No signs! Why, if I hadn't noticed this other car already stopped here, I would probably have driven right by without knowing what's here!"

But not everyone is disappointed by the agency's laid-back management style. I remembered an afternoon in Utah with Scott Groene, an environmental attorney who has battled the BLM over land-use issues for years, and he was telling me: "We used to say that if the BLM didn't do a good job with a place like Grand Staircase–Escalante, then take it away and give it to the Park Service. But some of us now realize that with the Park Service what you get is pavement into the heart of the place and a visitors center. So maybe there's a better chance of protecting the resource under a management accustomed pretty much to leaving the resource alone. The public lands could become that Big Open that's hard to get to but easy to get lost in."

I remembered Groene's big smile and the shake of his head. "Now if I had said that five years ago," he went on, "my environmental friends would have called it heresy."

LIKE MOST UNITS of the National Landscape Conservation System, the Parashant has a long history as cattle country, and it's cattle country still under the bureau's authority to permit regulated

livestock grazing on existing allotments. Among the families that can be counted a part of that history are the Esplins. They have been running cattle on the Arizona Strip since the 1880s. And today, with an inholder's private ranch on the Shivwits Plateau and a permit to graze several thousand acres of adjacent federal land, the Esplins run crossbreds on the Parashant and wonder what sort of history was writ in stone for them when a President proclaimed this range a national monument.

"We had a wonderful relationship with the BLM," Terry Esplin was saying. "But I have to tell you—this monument has sure put a strain on things."

I had met Terry Esplin up in St. George, Utah, and we had come down the road toward the monument to feed hay from the back of his truck to a couple of horses. He is a fourth-generation rancher, this Esplin with the wind-chapped face and sad eyes. He leaned against the side of his truck and said, "The BLM keeps assuring us that nothing is going to change, but what if it does? They've already said we can't collect firewood. But we've always done it to heat the ranch house." The BLM, however, explains that this is a temporary ban that is being reviewed.

Esplin remembers growing up on the Parashant and cherishes in particular the memory of going out to Kelly Point to camp with his father. "We wouldn't see another person for weeks," he said. "That's what you want to remember. But now, all this uncertainty decreases your hope for the future."

And what was his hope?

"I have three sons," he said. "If they want to stay with the ranch, I want them to have that opportunity. It's our heritage to ranch. It's our life."

With or without monuments, the ranching heritage of Terry Esplin's kind may be heading for a last roundup in the arid regions of the West. Swivel-chair corporations rather than saddlesore cowboys fill the meat lockers at McDonald's and Morton's of Chicago nowadays, and feedlots incrementally usurp any valid need for the open range.

What's worse, the way most ranchers see it, are all those city-slick environmentalists who'd just as soon there were no cattle grazing the public grass and, by inference, no more inholder ranches, no more home-on-the-range. One of the most significant additions to the National Landscape Conservation System looked like a lost cause for months last year as ranchers and environmentalists butted heads over a place in southeast Oregon called

Unlike most of the federal estate, *BLM lands are often intertwined with private lands.*

On Medicine Lodge Creek in eastern Idaho, the river bottom is private, the hills publicly owned.

"Some people will come here expecting to find the full services of a national park. They'll be disappointed."

They're everywhere, even in Red Rock Canyon, where mobile phones have come in handy summoning rescuers to climbers in distress. In the new Canyons of the Ancients National Monument in Colorado, an Anasazi tower may have been used to call men to arms.

Steens Mountain. The ranchers wanted range, the other folks wanted wilderness.

You only have to see it once to know that the Steens is surely a prize, whatever your druthers. Thirty miles long, topping out at an elevation of 9,773 feet, its basaltic backside rising a full mile straight up from the playa of the Alvord Desert, the Steens is one of the largest fault-block mountains in North America, a place of aspen groves and alpine meadows and glacial cirques and hanging valleys watered by sparkling streams. It is a welcome relief from the parched flatlands roundabout.

Over the years a number of ideas have been advanced to give Steens Mountain some measure of protection, but almost every one received a chilly reception. First it was proposed that the Steens be taken away from the BLM and designated a national park. That idea soon sank under the weight of local and congressional opposition. Then it was thought that the mountain might become a national conservation area, but the implications of the word "conservation" disturbed local ranchers almost as much as the jarring sound of that four-letter word "park." Finally, as last year's squabbling over the Steens dragged into the summer, Interior Secretary Babbitt informed the governor of Oregon, its congressional delegation, and the opposing local interest groups that if they couldn't come up with their own legislative measure to protect the area, he would urge President Clinton to designate it a national monument. The carrot and the stick. And it worked. On October 30 Clinton signed the Steens Mountain Cooperative Management and Protection Act. It establishes on the mountain nearly 175,000 acres of statutory wilderness—and more than half of that off-limits to livestock—in return for assurances that the locals will have a say in how the rest of the public land will be managed.

ONE MEASURE of how rapidly the Old West is turning into the New is a consensus that managing cattle on the public lands is no longer the bureau's number one problem. That dubious honor has shifted to a more powerful harbinger of ecological woe—the off-road vehicle, alias the SUV, the dune buggy, the dirt bike, and the ATV, the all-terrain vehicle that goes where even cattle cannot. "The dramatic increase and subsequent environmental impacts from these popular recreational vehicles was not anticipated," a red-faced bureau confessed in a report to Congress early last year. And it went on to cite those impacts: a proliferation of unauthorized

Rain that never hits the ground, *virga paints a dramatic sky above Steens Mountain,*

a 30-mile-long massif in southern Oregon shared by ranchers, miners, and recreational users.

The Steens—a place of aspen groves and alpine meadows and hanging valleys watered by sparkling streams.

Lending his weight, Zed Davies helps his father, Stacy, mend fences on Roaring Springs Ranch, not far from Steens Mountain's famous notch (right). Ranchers and environmentalists mended fences of their own to reach a mixed-use plan for the area. "Everybody got a little bit of what they wanted," says Davies.

trails, habitat fragmentation, a reduction in air and water quality, and conflicts between motorized and nonmotorized visitors.

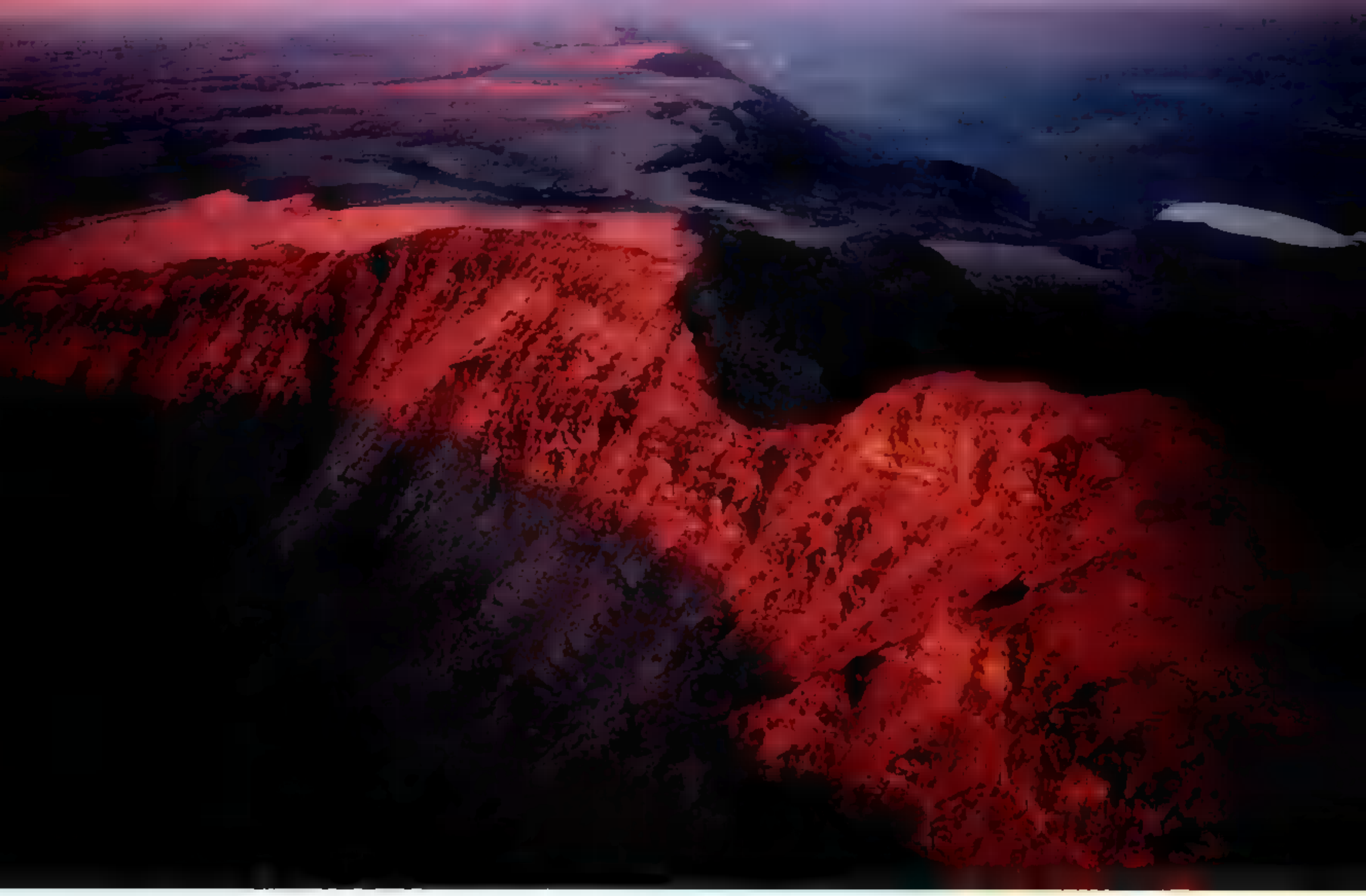
And how did the agency explain this unanticipated turnover—from cattle to combustion engines? Well, there had been "myriad" factors, such as the growth of western cities that positioned more people closer to the public lands and a robust economy inflating disposable incomes along with a compulsion by many to invest some of that income in off-road vehicles—an average nationwide sale of 1,500 recreational machines every day, according to the BLM. Then, too, there was the fact, barely whispered by the agency, that many of our public lands, including wilderness study areas, have traditionally had no or few restrictions as to where off-roaders may legitimately travel.

Vehicular abuses are especially visible in the canyon country of southern Utah. The outliers of Moab, once the uranium mining capital of the West and later the mountain-biking capital of America, are now the off-roaders' playground, a virtual Times Square of scuffed slickrock, scattered sand, and eroded soils. From the air, parts of Behind-the-Rocks, a wilderness study area west of town, look as if they had been flayed by a cat-o'-nine-tails. Here and elsewhere the BLM protests that it has neither the budget nor the staff to control the problem.

Having spent some time over the years camping and prowling across Utah's slickrock backcountry, I can sympathize with the "nonmotorized" visitor—the backpacker, for example—who would like to see some reasonable restrictions imposed on the freewheelers of the off-road fraternity. But in its report to Congress, the bureau had implied that off-road vehicles were also causing headaches for ranchers. And I wondered how that could be until someone told me I ought to drive out to the Dugout Ranch, at the edge of Canyonlands National Park, and hear what Heidi Redd had to say about the mechanization of the great outdoors. So I did that.

Heidi Redd has been ranching the Dugout for 30 years. With the help of her two sons and one wrangler, she runs about 650 head of cattle on BLM and U.S. Forest Service grazing allotments, and another 60 on the acres she owns along Indian Creek. And yes, she has plenty to say about off-road vehicles.

"It's gotten out of hand," she said. "There's hardly an inch of land in the backcountry where you can't see an ATV track. At Indian Creek you get the rock climbers, who are just as hard on the land. They don't want to walk in from the road so they make all these side



trails with their vehicles. Come here on Easter weekend and there could be a thousand of them trying to find a crack to climb. Of course nowadays nobody comes with just a backpack to see country. They bring their toys. ATVs. Climbing gear. Mountain bikes. They take baths in our water troughs. I ride out a ways and I'm weaving through tents."

We sat at the kitchen counter in the ranch house, and after a while Heidi Redd's anger gave way to introspection. She said, "We all have our vested interests, don't we? I have to look at my own activities too. With elk increasing on the allotment, and the demands on forage, what's my responsibility now? When I see all these demands on the land—wildlife, recreation, ranching—I have to question whether the land can take all of these uses. It's a huge responsibility, grazing on public land. Is my time here about over? I don't know."

HEIDI REDD RAISES a good question about the public lands: How much can they take? Will these early years of the new century find Americans in search of outdoor recreation pounding the Big Open as mercilessly as cattlemen and loggers and miners did through much of the century just past? And where will the rush to the out-of-doors leave places like Steens and Soda Mountains? Many of the policymakers who set these gems in place no longer fill positions of authority. There's a new team running the BLM and the Department of the Interior, and their views about land use in the West do not reflect the thinking of those who preceded them.

Right now, all I can do is wish this agency—dare we call it the Bureau of Landscapes and Monuments?—the best of luck taking good care of these wonderful places. Sure, there are still some skeptics who doubt that the bureau will be up to the job. But I'm not one of them. I'm the kind of cockeyed optimist who believes that the Congress, the agency, and the American people will not forget the words of Theodore Roosevelt almost a century ago. "The nation," he said, "behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value." Those words were spoken by President Roosevelt not long after he used the Antiquities Act to make the silk purse of a national monument out of the cow's ear of our public domain. □

MORE ON OUR [illegible]

Watch an interview with photographer Melissa Farlow and add your opinion to our forum about the changing face of public lands at **nationalgeographic.com/ngm/0108.**

SPIDERWEBS

DEADLY

Death by spider.

Nabbed, grabbed, and

swathed in silk, a

hapless beetle meets

Argiope argentata

and one of nature's

most versatile arsenals.

SILK

By RICHARD CONNIFF

Photographs by

DARLYNE A. MURAWSKI

One afternoon in a highly unpromising habitat—the courtyard of a hotel at a highway junction on the outskirts of San José, Costa Rica—a biologist named Bill Eberhard bent over a patch of garden where nothing much seemed to be happening. He held up a double layer of old gym socks stuffed with cornstarch and tapped it softly. *Pa-pa-pa-pa-pa-pa-pa-pa.* A cloud of white dust drifted across the garden and settled on every surface.

Like images taking shape in the darkroom, spiderwebs began to materialize. "They come out of nowhere," Eberhard said. There were five or six of them in an area of about a square foot, most of them classic orb webs, with spokes radiating out from a hub. Each orb was perfect in its way, with a thousand or more delicate intersections, each skewed to its own peculiar catching angle, and each, until the moment the powder settled, nearly invisible. For insects on the wing it must have been like swimming through a bumper-to-bumper sea of fishing nets. Except that some spiders, unlike human fishermen, eat their nets and reweave them up to five times in a day. "These are just the ones they've rebuilt since it stopped raining," said Eberhard.

LA SELVA, COSTA RICA (OPPOSITE PAGES); MONTEVERDE, COSTA RICA

Radiant! An orb web's doily-like stabilimentum (opposite) is an enigma: Some say it hides the spider and foils predators, others that it reflects ultraviolet light, luring insects. According to one theory, as a fly hits a web (above), silk coiled inside beads of glue unreels to let the web give.

Spiderwebs are everywhere, and if they happen not to be somewhere at the moment —for instance, in the living room you have just compulsively vacuumed clean—they will almost certainly be there soon: When a spider yearns to travel, it climbs up to a high point and pays out enough thread to catch the breeze and balloon itself skyward, with limbs akimbo for maximum float. These aeronautic maneuvers can take a spider more than two miles high and 200 miles cross-country, though a typical trip may last no farther than the next bush. This form of travel is so routine that in one study roughly half the spiders in a two-and-a-half-acre field got there by air—1,800 spiders drifting in on their gossamer parachutes each day, like paratroopers over France during the invasion of Normandy. All of them armed and dangerous, at least to insects: A British researcher once calculated that local farmland harbored more than two million spiders per acre—and that the insects consumed by spiders each year nationwide would easily outweigh the human inhabitants.

The chief weapon in this endless slaughter is, of course, the spiderweb, and the soldiers are mostly female. Males typically abandon web-building when they reach maturity and instead wander around making love, not war. But females need the protein from insect prey to produce eggs, and they weave webs throughout their lives.

ARGIOPE ARGENTATA, LA SELVA

In the beginning, roughly 400 million years ago, spiders used their silk mainly to weave a hiding place, possibly with a trip wire out front to detect insects. But then the reclusive and wingless spider suddenly took to the open air. "The reason spiders evolved aerial webs in the first place," says Jonathan Coddington, of the Smithsonian's National Museum of Natural History, "is that insects evolved wings." Tarantulas, trap-door spiders, and some other species still use their silk mainly for shelter, but about a third of the 35,000 known spider species (Coddington estimates there may be 135,000 more) are orb-web weavers, and another third weave sheet webs, cobwebs, and other implements of insect death.

SOME SPIDERS, UNLIKE FISHERMEN EAT THEIR NETS AND REWEAVE THEM UP TO FIVE TIMES IN A DAY.

You get a sense of how clever these weapons can be on a short walk with Eberhard, a lean, taciturn 57-year-old on the faculty at the University of Costa Rica and the Smithsonian Tropical Research Institute. One morning at La Selva Biological Station, in the Atlantic foothills of Costa Rica's central mountain range, Eberhard and I went out wading waist-deep in a rain forest stream, with our faces down close to the surface. Watching spiders means narrowing the scope of your world and moving in millimeters, and Eberhard is a master at this.

He does not hesitate to hum to a spider (spiders can associate particular prey with a specific musical note) or to pick one up with

LA SELVA

his fingers for detailed examination. ("When squeezed gently on the abdomen," he has written, one spider "produced a strong, somewhat disagreeable odor reminiscent of . . . lampyrid beetles and canned string beans.") He has been bitten just once. I asked if this was because the threat of spider bites is grossly exaggerated or because he is careful about which spiders he grabs. "Both," he said.

We were looking for a spider in the genus *Wendilgarda*, which strings a sort of tightrope across a stream and "glues" its web to running water. After an hour of searching, Eberhard called me over and said, "Here's one," indicating a spider smaller than a freckle, suspended above the water between the drooping leaves of a dieffenbachia. He took out the cornstarch and went *pa-pa-pa-pa-pa-pa-pa-pa.*

"Part of the zen of this is you find a thing like this and you leave it alone," Eberhard whispered, a subtle attempt to get an outsider to throttle back and see the world in spider time. "You get a little powder on it and figure out which lines are connected to which and which plants are connected, so you can see how to move around it without disturbing it."

The powder revealed 13 separate lines down to the surface, like the leaders on a fisherman's trotline. The riffle of the stream kept the end of each line skating back and forth in search of water striders. After about 15 minutes, irritated by the weight of the powder, the spider began

The patient night angler *Deinopis* hangs still and twig-like — a moth larva inches into range. In a flash, the predator stretches its net wide and scoops up its quarry. Lightweight silk forms the web's rectangular scaffold; woolly white threads combed from the cribellum—an extra silk-releasing organ on the abdomen of some spiders—complete the elegant snare.

to cut away the old lines and replace them. It descended to the surface on a thread, like a mountain climber on a rappel, and dabbed the water with the silk spinnerets on its hind end. I asked how this brief maneuver can attach a silken thread to running water, something humans cannot achieve with our best superglues. Eberhard suggested that the attachment was more like a sea anchor, a burst of threads held in place by surface tension. The spider climbed halfway back up, then down to the surface again, this time applying a length of a special sticky silk to entangle its victim.

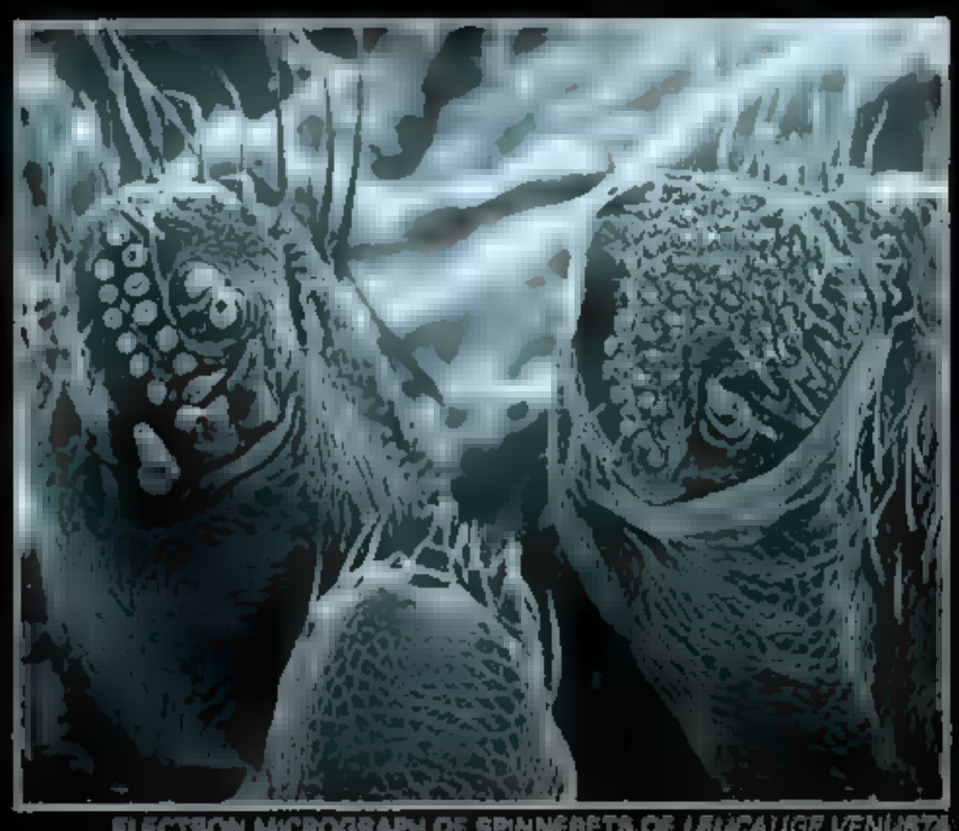
"You have an essentially blind animal with a limited nervous system building a complicated structure in an unpredictable environment," said Eberhard. "The spider makes what for a human would be very complex calculations: 'How big is the open space? How much silk do I have? What attachment points are available?' Spiders are not little automatons making the same thing over and over. They're flexible. And they're not stupidly flexible; they're smart flexible."

Among other accomplishments, Eberhard discovered a species that has reduced its web to a sort of spitball on a thread. It imitates the perfume of a female moth to lure male moths into its neighborhood, then beans them with the spitball and reels them in. He named the species *dizzydeani*, after the celebrated pitcher who used to do the play-by-play on baseball games when Eberhard was a kid in Arizona.

That evening, with a headlamp on, Eberhard set out for a walk in the rain forest at La Selva. We stopped almost immediately to watch an ant walk into a spider's sticky thread, which instantly yanked it into the air, legs flailing. Eberhard turned—and again stopped almost immediately, at a web consisting of a single unsticky strand on which insects roosted like birds on a wire. A green spider lurked nearby, its long, thin abdomen curled up like a tendril. Its technique is to creep with vinelike patience toward an insect using the roost it has provided. It reaches out its front legs and gently, almost imperceptibly, tastes the insect with the hairs on its feet. Then, in a flurry, the spider wraps its prey in silk. Eberhard started to walk and, again, stopped. His headlamp picked out a classic orb web, with the concave shape of a satellite dish. "Watch this," he said. He touched the web from behind, and it sprang forward.

THE SILK FACTORY

More than and stronger than steel, spider silk has been at the core of eons of . Spinning glands produce the protein stuff, which spiders let out like string from multiple spigots—sometimes multiple strands into a single, solid thread. For different uses—dragline, web frame, egg case, retreat, or bug trap—threads may emerge thick or thin, wet or dry, sticky or woolly. The common orb web typically gets some of each.



ELECTRON MICROGRAPH OF SPINNERETS OF *LEUCAUGE VENUSTA*

Most spiders have three pairs of spinnerets covered with hundreds of silk-releasing spigots—external openings of the silk glands. The spigots are turned on and off muscularly by the spider.

WEAVING THE REMARKABLE ORB

First threads 1 An orb weaver bridges the between two objects by laying down a then creates a simple star—a few threads attached to the surroundings and uniting at a single point, the hub.

Frame and radii 2 Starting with a bridge thread across the top, the web's outer edges are laid. Then the spider places radii like wheel spokes from hub to frame.

spiral 3 This mesh serves as scaffolding and guide for the sticky spiral's construction.

Sticky spiral 4 5 the center and often along the way, the spider lays the sticky, elastic capture threads. Then it rebuilds the hub and settles there to await a meal. Time spent: less than an hour and a half. Amount of silk used: up to a hundred .

COMPOSITE SPIDER BY DOUG STERN; WEB IMAGE GENERATED BY SAMUEL ZSCHOKKE, UNIVERSITY OF BASEL, SWITZERLAND; MICROGRAPH BY JONATHAN CODDINGTON, SMITHSONIAN INSTITUTION

THE SPINNING GLANDS

- **Piriforms:** [illegible] form [illegible] disks of fine silk that strengthen the bond between two threads.
- **Aciniforms:** Aciniform fibers [illegible] swathing, [illegible] inner cushion [illegible] and the [illegible] used in stabilimenta—white bands or circular patterns that adorn [illegible] are debated [illegible] scientists.
- **Ampullates:** [illegible] produce the threads [illegible] form the orb web's [illegible]
- **Aggregates:** [illegible] to orb weavers [illegible] relatives, aggregates yield the glue that makes the sticky [illegible] sticky.
- **Flagelliforms:** Also only in [illegible] species and their relatives, these glands produce the axial threads [illegible] the sticky [illegible]
- **[illegible]:** These female glands [illegible] the [illegible] for cocoons.

COMPUTER-ENHANCED ORB WEB OF [illegible] *CLAVIPES*

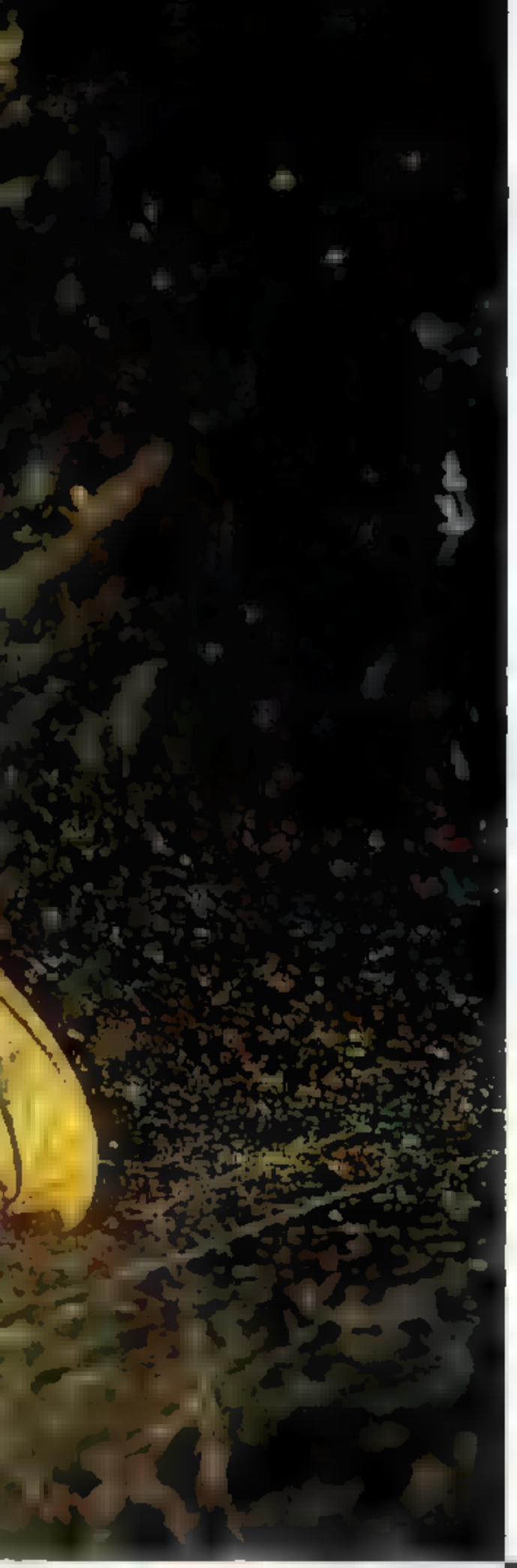
Then, magically, it became concave again. The spider, said Eberhard, uses a spring line running straight back from the hub to winch the web into the cocked position. "Some prey, like mosquitoes, fly very tentatively, with their forelegs out, and as soon as they touch a web, they back off." So this web springs out to follow them. Our walk continued like that, stop and start from web to web. After a couple of hours, having journeyed through an entire deadly universe in miniature, we turned back. We had covered all of 50 yards.

"That's how it is with spiders," Eberhard said. "You go nowhere."

THE SPIDER PASSES ITS LIFE IN HUNGER, UNCERTAINTY, FEAR, AND TREMBLING.

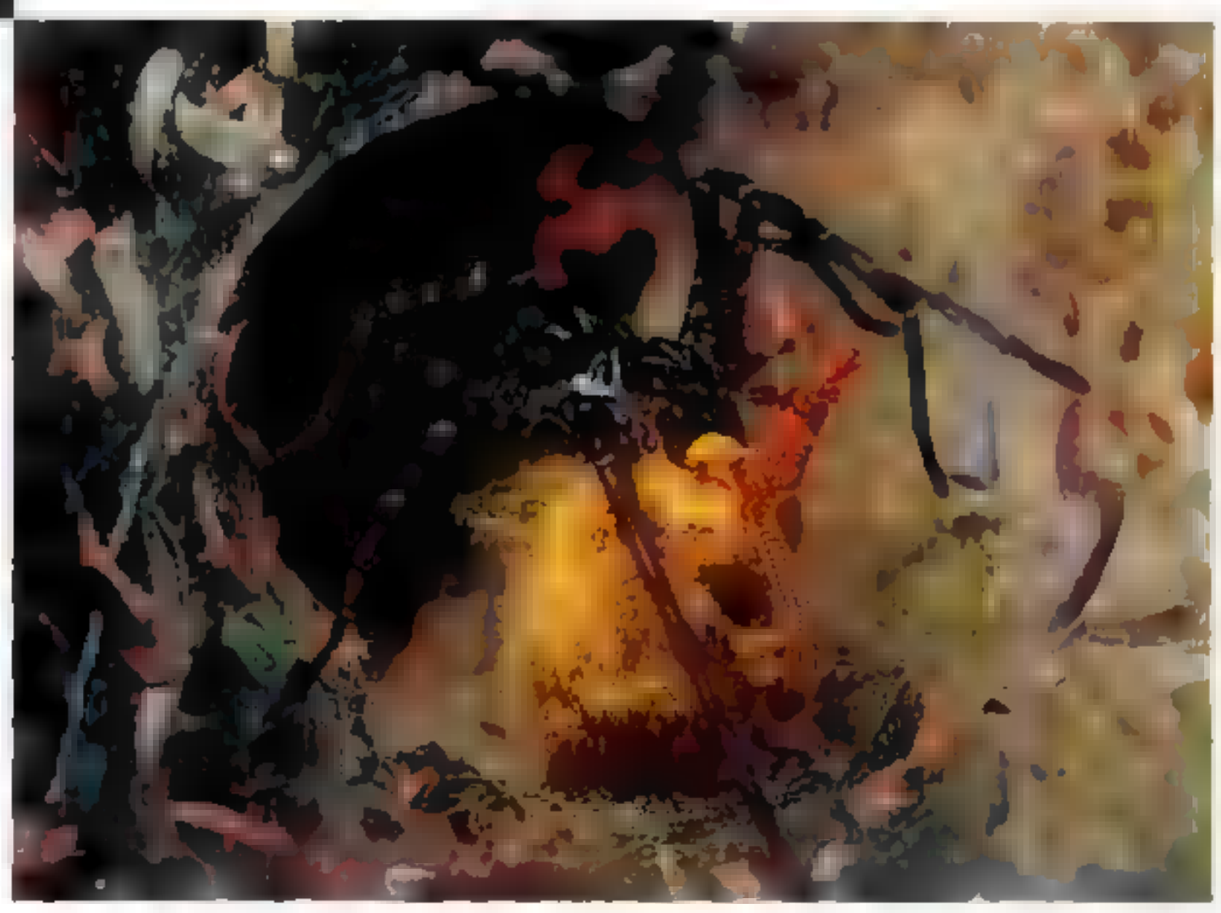
THE ZEN OF GOING NOWHERE was beginning to grow on me. One day back home, I was watching a spider spin its astonishing construction between my desk lamp and telephone (it was a slow day), and I suddenly wanted to become a spider, at least for a little while. I picked up the phone (a cataclysm for the spider) and found a climbing instructor named Stefan Caporale, who agreed to help me build my own orb web, in the corner between two climbing walls at the YMCA in Worcester, Massachusetts. Caporale fitted me out with a climbing harness and Jumar ascenders. I'd never done any rope climbing, but with a slingful of the metal clips called carabiners over one shoulder and a rope bag in lieu of a silk gland over the other, I felt like *Charlotte's Web* meets *Rambo*.

I was, of course, going to have to cheat, starting from the moment I climbed one wall, tied my first line, and looked across 15 feet of open space to the point where I'd be anchoring the opposite end. A spider bridges this span the same way it makes a parachute, by lifting its hind end and paying a length of silk out onto the breeze. This wasn't going to work for me.



On the homespun sheet surrounding her funnel web, a female *Tengella radiata* waylays a moth with a leggy embrace and paralyzing bite (left). After tiny kleptoparasitic spiders or insects feast on her regurgitated juices, she scurries down the funnel with her hard-won meal. Another moth, balled up and wingless from battle (below), is rushed into the silken tube.

LA SELVA



It was cheating just to look. A spider knows what's happening around it largely by touch. It relies on as many as 3,000 vibration sensors, called slit sensilla, most of them on its spindly legs. Eberhard had e-mailed me this thoughtful advice on my web-building: "Do it (as much as you can) with your eyes closed."

Having tied my line to a bolt hanger, I climbed back down and climbed up the other wall, where I pulled my spanning line taut. Then I shinnied back out the spanning line, trailing rope behind me. The idea was to leave this rope slack and let the middle of it drop down to become the hub of the web. A spider can do this blindfolded. Then it rappels down from the hub and stretches a spoke to the bottom of the web, keeping the whole thing under tension. Creeping out into midair, 15 feet above the concrete floor, I moved by millimeters. My muscles quivered. Then I began to oscillate, until I was flailing wildly from side to side and spinning sweat in all directions. It took me a half hour to get the first spokes in place. The average orb-web spider, working at an effortless trot, would already have completed an entire web, with perhaps 30 spokes. Many spiders rush to complete their webs in the last minutes before dawn, to minimize their daylight exposure to predators and also to have everything nice for insect rush hour.

My excuse was that I had to link up all my intersections with carabiners and cumbersome knots. A spider does the same thing with a quick dab of fibrous glue, one of as many as six silklike products it may use to build a single web. The spider applies its silks with a half dozen spinnerets, each resembling a showerhead with several tiny spigots and each spigot connected to a particular type of silk gland. The silk comes to the spigot as a liquid, a soup of accordion-pleated amino acids. To spin thread, the spider reaches back with a hind leg and yanks silk from the spigot. This shears the silk, so one set of pleats tucks neatly into another, forming hydrogen bonds and making a solid thread. The spigot also controls diameter and flow rate; it will spin thicker thread if you put weights on the spider's back and thinner thread if you put the spider in the zero gravity of outer space.

After four cautious, creeping hours I managed to complete my framework, with a total of just nine spokes. But I had yet to weave the real killing surface of the web, a thread that spirals from the hub out to the edge and crosses the spokes to form a sort of fretwork. A real spider builds two such spirals for every orb web. The first is just a temporary scaffold


NEPHILA
LA SELVA


A wasp in her thrall—
giant Nephila paralyzes
prey with a lethal bite.
Her golden web—
spanning three feet or
more—is the largest
of all spinning spiderkind.

to stand on. As the spider moves around the web, it eats up the sections of scaffold it no longer needs and recycles the silk. The second, permanent spiral consists of sticky silk. The spiders themselves don't get stuck, according to one theory, because they have an oil coating on their feet. They're also careful to walk on the nonsticky framework of the spokes.

Dangling from my web at the YMCA, I realized that I was never going to cut it as a spider. A real spider's web isn't a big, dumb net like the one I was building. It's a dynamic weapon in an endlessly escalating evolutionary war between spiders and insects. For instance, the silk in the framework of the web has evolved to be almost invisible. Thus a fruit fly approaching at 57 body lengths per second may not detect impending disaster until it is three body lengths away. But the fruit fly in turn has evolved optic nerves hardwired directly to its maneuvering wings, so it can still reverse direction and escape before hitting the web.

The sticky silk must be extraordinarily elastic, bulging on impact to as much as four times its resting length. Some spiders also clutch the spokes of the web tight and release them when an insect hits to avoid snapping it, trampoline-style, back into the stratosphere.

After five hours I finished my web. It was a little lumpy and off-center, and a real spider would probably have been ashamed, not to say extinct. Scaling up from the spider's body size to my own, I should really have been spinning a web 30 stories high between the twin towers of the World Trade Center. Still, I had built something unmistakably modeled on a spiderweb, and I was proud.

For a spider this would be just the beginning. The whole point of all the calculations that a spider has made so far has been to catch insects. And the webs are remarkably productive: On average, spiders eat about 15 percent of their own body weight daily. "To do that," Eberhard said, "you'd have to catch four or five rabbits a day, every day. If you didn't have a gun to shoot 'em, that's an awful lot."

Tiny social spiders share silk, weaving large communal webs and bagging bigger meals like a katydid (right). But other relationships are one-sided: *Hymenoepimecis* wasps parasitize *Plesiometa argyra* spider females (below, with wasp larva) and alter their behavior. Against orb-weaving instincts, *P. argyra* is induced to spin a cable-like web—to support her foe's pupal cocoon. The wasp larva then kills and eats its spider host.

LA SELVA

IT'S EASY to feel sorry for the insects. One day I watched a tiny wasplike creature, long and thin with a purple metallic body. Through a magnifying glass it looked oddly human. It was stuck to a web by two of its legs and by its long antennae, and it was using its forelegs to groom the antennae in an attempt to free them from the glue. Then it got frustrated and lashed left and right, swiveling frantically around the vertical line of the sticky silk. A little later it got its abdomen stuck on one of the other lines of the web, and its struggles soon ceased. There was something

ANELOSIMUS EXIMIUS, CUYABENO FAUNAL [redacted] RESERVE, ECUADOR

terribly poignant about its plight.

But for the spider, insects are not easy pickings. First, the spider must figure out exactly where an insect has landed, usually by jerking on the spokes of the web to see which one is carrying extra weight. A spider with a frail web may need to get to its victim instantly. On average a fly stays in an orb web for just five seconds, and researchers estimate that up to 80 percent of all insects actually get away. But the spider must be cautious too; if the victim is a bombardier beetle, for instance, it might shoot boiling liquid at the spider. Depending on the insect, the spider may lunge at its victim and inject paralyzing poison. Or it may immobilize its victim with a quick wrap of a special gauzelike silk. Or it may simply stop at a safe distance, cut its victim loose, and walk away. If the framework is badly damaged, it may even need to build a new web. By now the average human would probably have a heart attack and collapse into the abyss.

LIFE IN THE WEB, AS ONE SPIDER SCIENTIST PUT IT, MEANS "HANGING YOUR BUTT IN THE BREEZE."

But the spider persists—not as the evil killer of popular lore, waiting malevolently for its hapless victim. On the contrary, I was beginning to think that the spider passes its life, as do we all, in hunger, uncertainty, fear, and trembling. Life in the web, as one spider scientist put it, means "hanging your butt in the breeze," where it is liable to be attacked by predatory birds or by huge helicopter-like damselflies. Hiding in plain sight is thus among the spider's chief preoccupations. Eberhard recently uncovered one of the most bizarre threats to spider tranquillity in the annals of science, and he generously pointed me to an oil palm plantation where I could see the horror story unfold for myself.

I headed down to Costa Rica's Pacific coast, and in an unwonderful forest where the palm trees stood in orderly rows, the zen of

spider-watching began to settle me. I walked slowly, stood still, exhaled, looked around. I watched the *Plesiometa argyra* spiders spin their perfect orb webs in the undergrowth. *Plesiometa* is a harmless, brightly colored orchard spider, small enough to fit on your thumbnail. When the sun slanted down between the trees, the iridescent webs shimmered in the light.

Then as I watched, a wasp flew up and, in a frenzy of long thin legs, stabbed its stinger into the mouth of a *Plesiometa*. The spider lapsed into stillness. The wasp was a slender creature about three-quarters of an inch long, with black eyes, dark violet wings, and orange legs. She curled her hind end under and jabbed her ovipositor against the paralyzed spider's abdomen—then deposited her egg and flew off.

Ten or fifteen minutes later the spider woke up and resumed its normal life, unaware that it now carried its own killer. According to Eberhard the wasp larva would hatch in a couple of days and make little holes in the cuticle of the spider to suck its blood. Nearby I found a spider going about its normal business with a fat round wasp larva wrapped like a bumper around the front end of its abdomen. The spider was feeding on prey, oblivious to the larva feeding in turn on its blood. For the first week or two the spider continues to build its orb webs several times a day. But then the wasp larva suddenly takes control of the spider's mind.

It happens at midnight. Instead of waiting till dawn to make its usual orb with thin, fragile spokes, the spider now goes back and forth up to 40 times on the same few spokes. Somehow, the wasp larva has switched on what Eberhard calls a "subroutine of a subroutine" from the spider's web-building software and switched off everything else. The result is a web of just a few sturdy cables, useless to the spider but perfect for the wasp larva, which now needs a place to suspend its cocoon for the final weeks of development.

"The spider makes this real strong web," said Eberhard, "and then it just stops and sits in the middle." It is waiting to be killed.

I found one of these webs in the morning. In the middle, hanging below the cables, a wasp larva worked on a dead spider like a half-starved child sucking marrow from old soup bones. By midday the larva looked like a glossy, fat cucumber, and it dropped the withered spider into the undergrowth. That night the wasp larva would spin its cocoon.

Wandering around the plantation, I found these cocoons everywhere, like little Christmas ornaments in the undergrowth, each securely suspended from its silken cables. I knelt to study one such cocoon. As the late afternoon sun shone through the parchment, I could make out the black eye spots of the wasp and the orange of its legs, which wriggled visibly. The adult wasp would emerge sometime after dawn and seek a mate. If it was female, it would soon find a spider to attack and a web to exploit, starting the whole parasitic cycle over again.

I stood and walked briskly out of the forest. Every now and then it is undoubtedly good to see the world through the eyes of a spider—or rather to close our eyes and feel our way around the spider's strange, silken universe. But at the end of the day I was glad to be merely human. □

EVERY NOW AND THEN IT IS UNDOUBTEDLY GOOD TO SEE THE WORLD THROUGH THE EYES OF A SPIDER. BUT AT THE END OF THE DAY I WAS GLAD TO BE MERELY HUMAN.

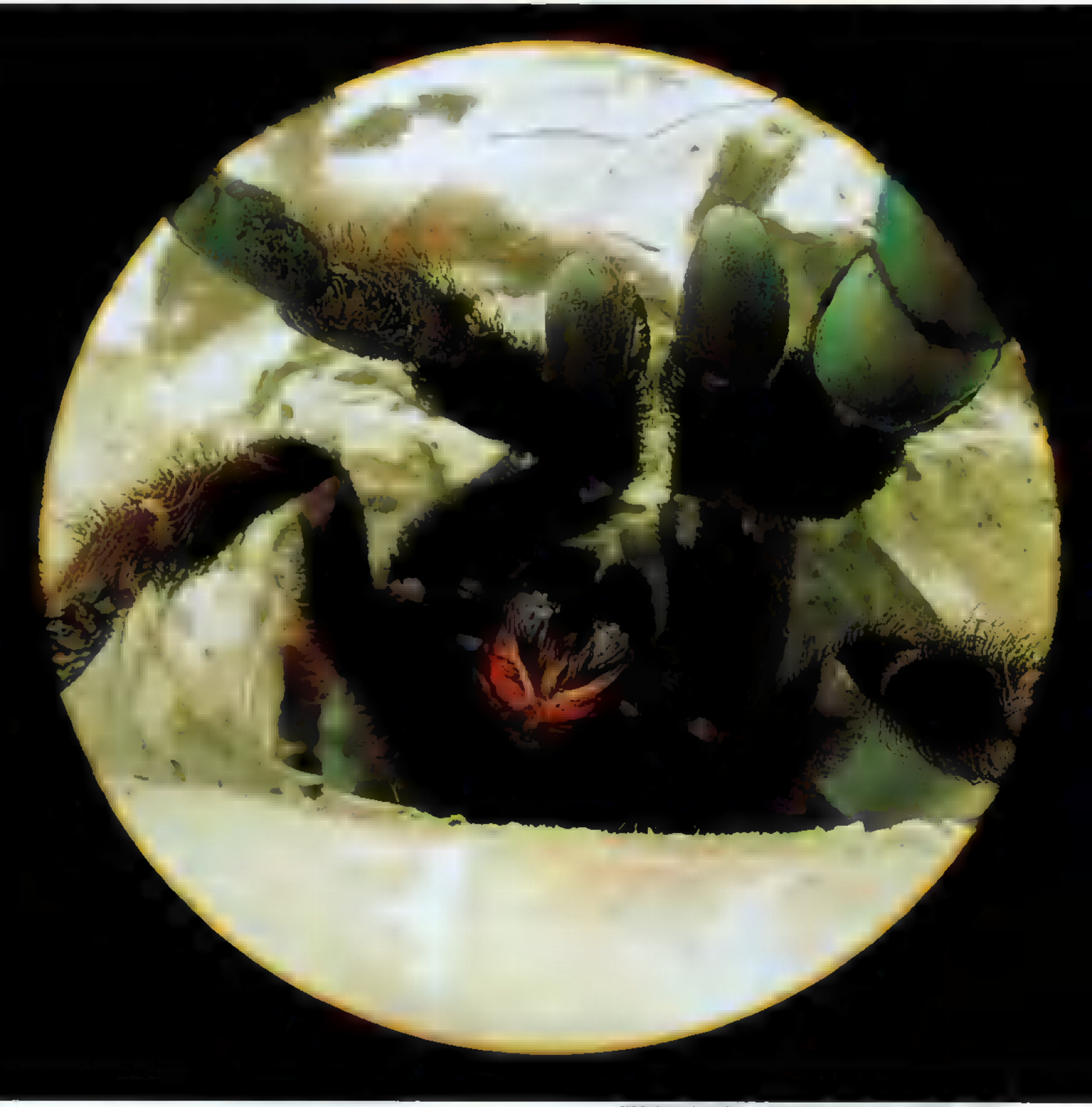
MONTEVERDE

MORE ON OUR WEBSITE

How much spider silk would it take to stop a jumbo jet in flight? Get the surprising answer — well — more photographs at **nationalgeographic.com/ngm/0108**.

The tie that binds, spider silk is stolen by hummingbirds to build durable nests (left). A cone-web spider spins her own strands to form egg sacs (right), which dangle from a dragline. Layers of several kinds of silk protect the eggs

from temperature changes and parasites. The primitive tarantula (below) produces [redacted] type of silk—to weave lairs and egg sacs—and snags ground prey without a web. Vertical orbs of many silks evolved as spiders' prey took flight.



EPEIROTYPUS CHAVARRIA, LA SELVA (TOP); FAMILY [redacted]OSIDAE, LA SELVA

IN FOCUS

LOCATION:

ARCTIC NATIONAL WILDLIFE REFUGE (ANWR)

ISSUE:

SHOULD THE REFUGE BE OPENED TO DRILLING?

BACKGROUND

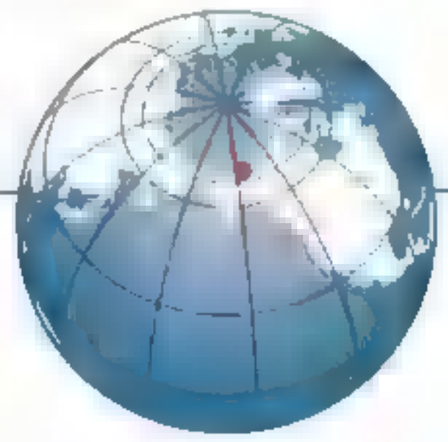
A WILDLIFE PRESERVE SINCE 1960, ANWR TODAY IS ONE OF THE WORLD'S LARGEST PROTECTED AREAS. NOW A 1.5-MILLION-ACRE SWATH OF THE LAND MAY BE TAPPED FOR OIL.

Oil Field or Sanctuary?

The [redacted] caribou herd grazes in the Arctic National[redacted]

KENNETH R. WHITTEN

ARCTIC NATIONAL WILDLIFE REFUGE



BY JOHN G. MITCHELL

SENIOR EDITOR

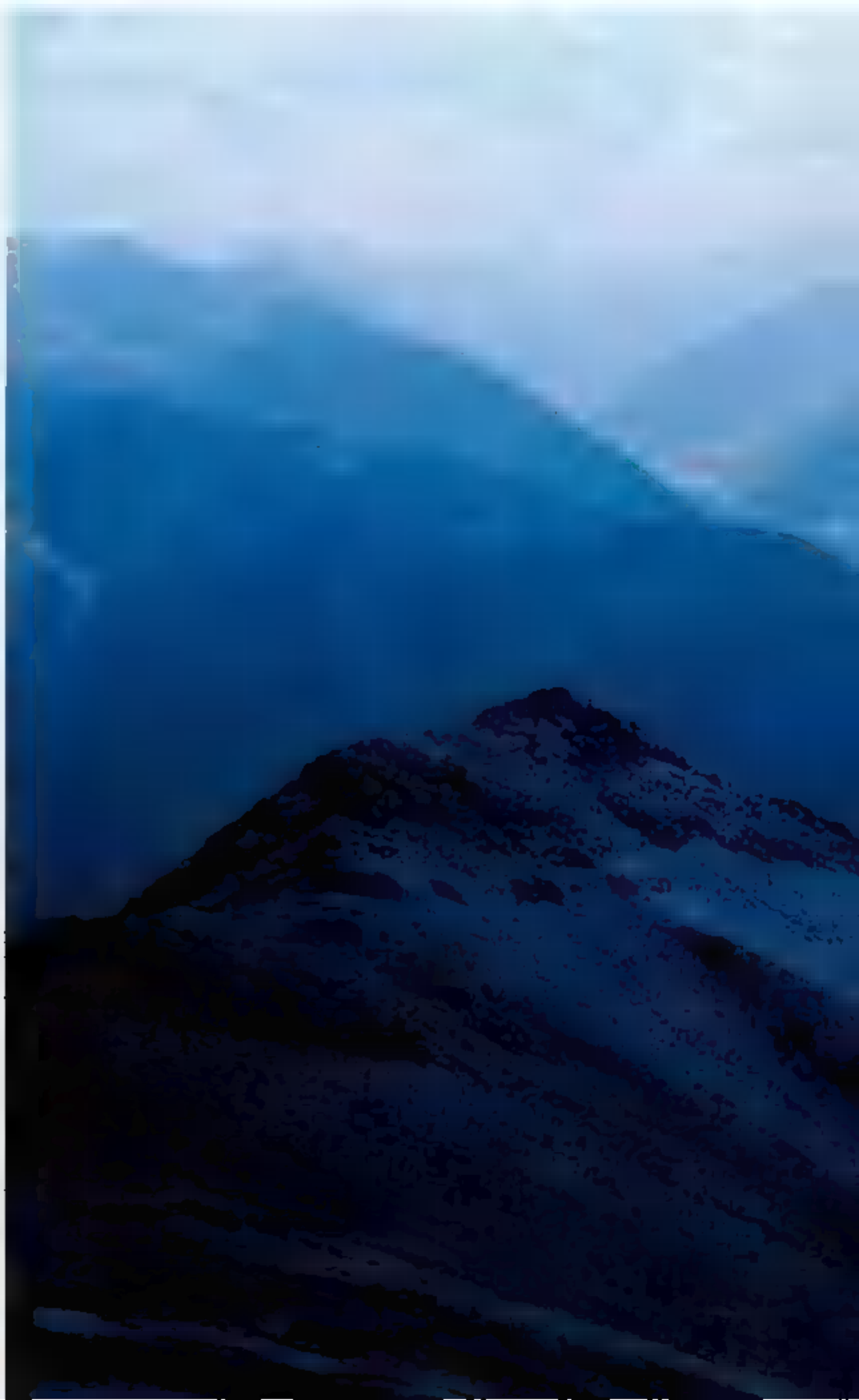
For starters, since the stakes are so high, imagine this slice of coastal Alaska as a deck of cards. Cut the deck in the right place and you could tap open a petroleum reservoir believed to have the greatest onshore potential for production in the United States. It could be a prize to be measured in billions of barrels—and billions of dollars. Or don't cut the deck. Let it sit there untouched—the biological heart of one of the largest protected natural areas on the face of the Earth, a prize to be measured in the diversity of its wildlife and the melody of its silence. But this is a choice only Congress can make, and it isn't a game: to cut and deal or not to cut on the coastal plain of the 19-million-acre Arctic National Wildlife Refuge in northeast Alaska.

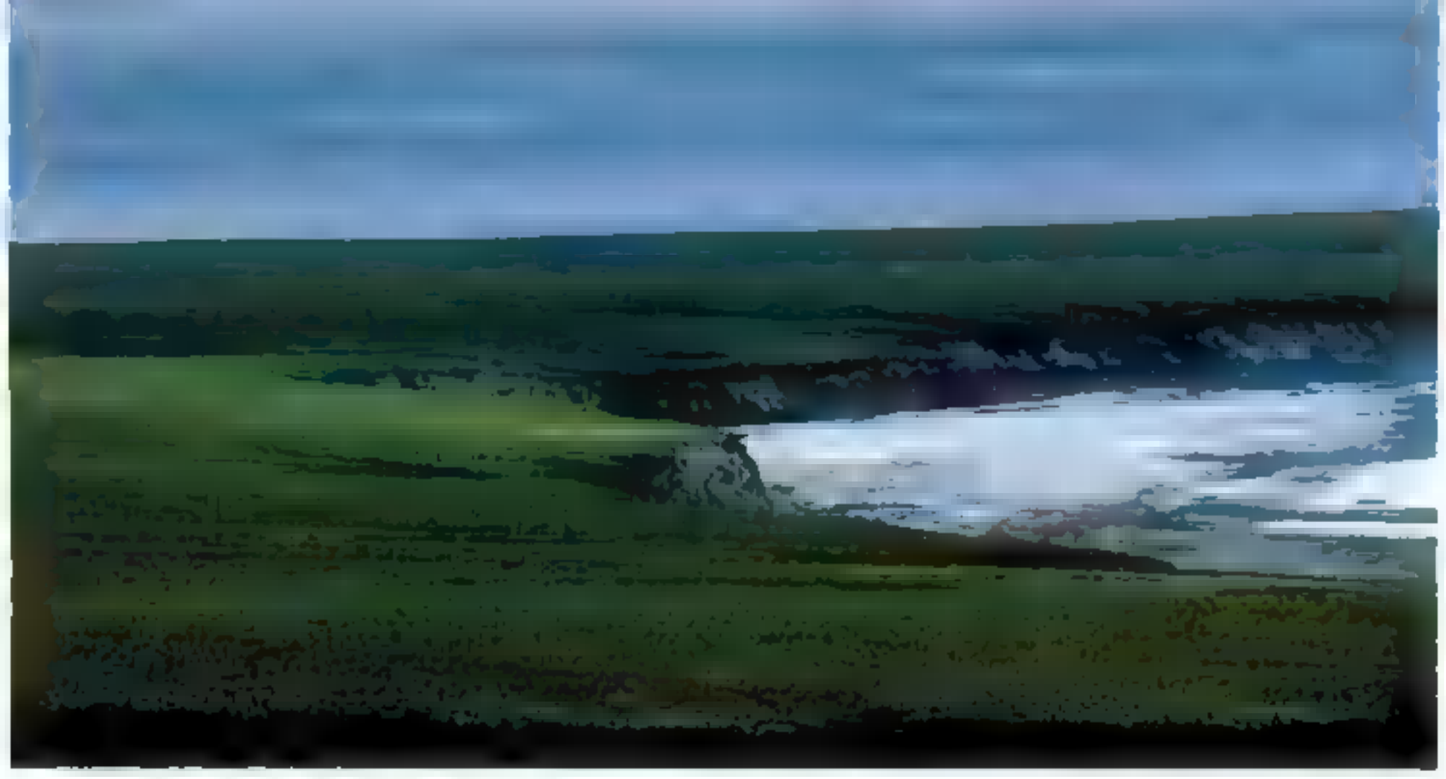
Pinched between the Brooks Range and the Beaufort Sea, the plain within the refuge stretches west from the Yukon border more than a hundred miles, a flat expanse of tundra laced with tussock wetlands and braided rivers. In 1980, when the Alaska lands act expanded the refuge to embrace an area the size of South Carolina—and designated 8 million acres of it statutory wilderness—1.5 million acres of the coastal plain was set aside under Section 1002 for study of its environmental value and petroleum potential. Hence the name: the 1002 Area.

In 1987 President Ronald Reagan's secretary of the interior, Donald Hodel, recommended to Congress that the 1002 be opened for oil and gas leasing, even though interior's environmental impact statement, prepared by the U.S. Fish and Wildlife Service, found that the "expected displacement and reduction of wildlife populations and natural processes would cause a major reduction in the value of the area as a pristine, natural scientific laboratory." Wilderness values within the 1002 Area, the report concluded, "would be eliminated."

If the service's report wasn't enough to turn Congress against the Hodel proposal, the grounding of the oil-laden *Exxon Valdez* in Alaska waters two years later was. Another proposal to drill was advanced in 1991 and soon defeated. In 1995 congressional Republicans attached a drilling provision to a budget bill; President Clinton vetoed it. Finally, earlier this year, President George W. Bush identified the 1002 as a plank in his energy agenda. In Congress the response was not enthusiastic.

One overriding question is whether the refuge's coastal plain contains enough oil to make its extraction worth both the economic





NATURE UNTOUCHED

Heralding [illegible] summer, a light coating of green awakens the coastal plain and breaking ice crackles as it melts on the Aichilik River (left) after months of darkness. Perpetual daylight energizes the 19-million-acre refuge from late April through mid-August, when 36 species of mammals—including the gray wolf—thrive.

If oil production is allowed in the refuge's 1002 Area—a 1.5-million-acre slice of the Arctic Coastal Plain—industrial drilling sites would scar the largely untouched land that [illegible] the mighty Romanzof Mountains (below). "That would totally diminish any kind of wilderness experience," says refuge biologist Fran Mauer.

cost and the environmental risk. Estimates of undiscovered petroleum resources there have varied wildly over the past two decades. Proponents of development often cite 16 billion barrels of oil as their best number, while some opponents hold the count to less than 4 billion barrels. But according to one recent assessment by the U.S. Geological Survey, seismic data and information provided from recent oil discoveries nearby indicate that the amount of oil that is technically recoverable from the 1002, not including native lands or offshore state holdings, falls into the range of 4 to 12 billion barrels, with the lower number having a 95 percent probability of recovery and the higher only a 5 percent probability.

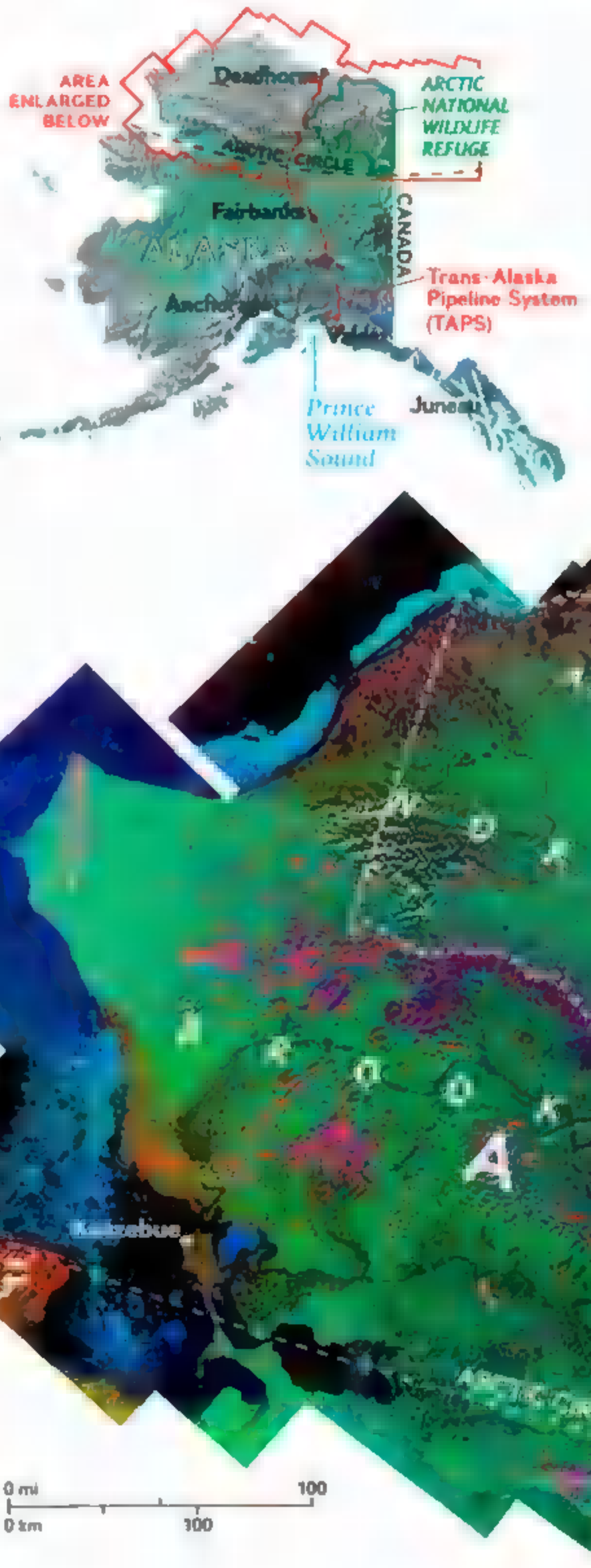
After folding in the cost of getting the oil to market, however, the USGS estimated the likeliest amount of oil that might profitably be recovered would probably fall between 3.2 and 5.6 billion barrels, assuming a market price of $20 to $25 a barrel. And this raises the second big question: To what extent would ANWR production help reduce the nation's dependence on foreign oil?

The U.S. consumes petroleum at the rate of 19.4 million barrels a day. About 57 percent of it is imported. That figure is certain to increase if domestic production continues to decline, as it has for a quarter century in the dwindling fields of the lower 48 and, more recently, in Alaska's largest North Slope reservoirs at Prudhoe Bay and Kuparuk. If oil from the 1002 were made available by Congress today, production probably would not begin until around 2010. At peak production—probably not until 2030—the field could produce about one million barrels a day. At today's rate of consumption that would reduce the current need for imports by only 9 percent.

"Extra domestic crude production of the greatest imaginable amount would still leave the Nation dependent on imports for at least 40 percent of its petroleum needs," the Congressional Research Service noted in 1996. "From an energy security perspective, the basic situation would be unchanged—the Nation would still depend heavily on imports." Later reports have softened that assessment, and President Bush has declared the amount of oil that could profitably be produced from ANWR to be more than enough to offset the quantity imported from Iraq.

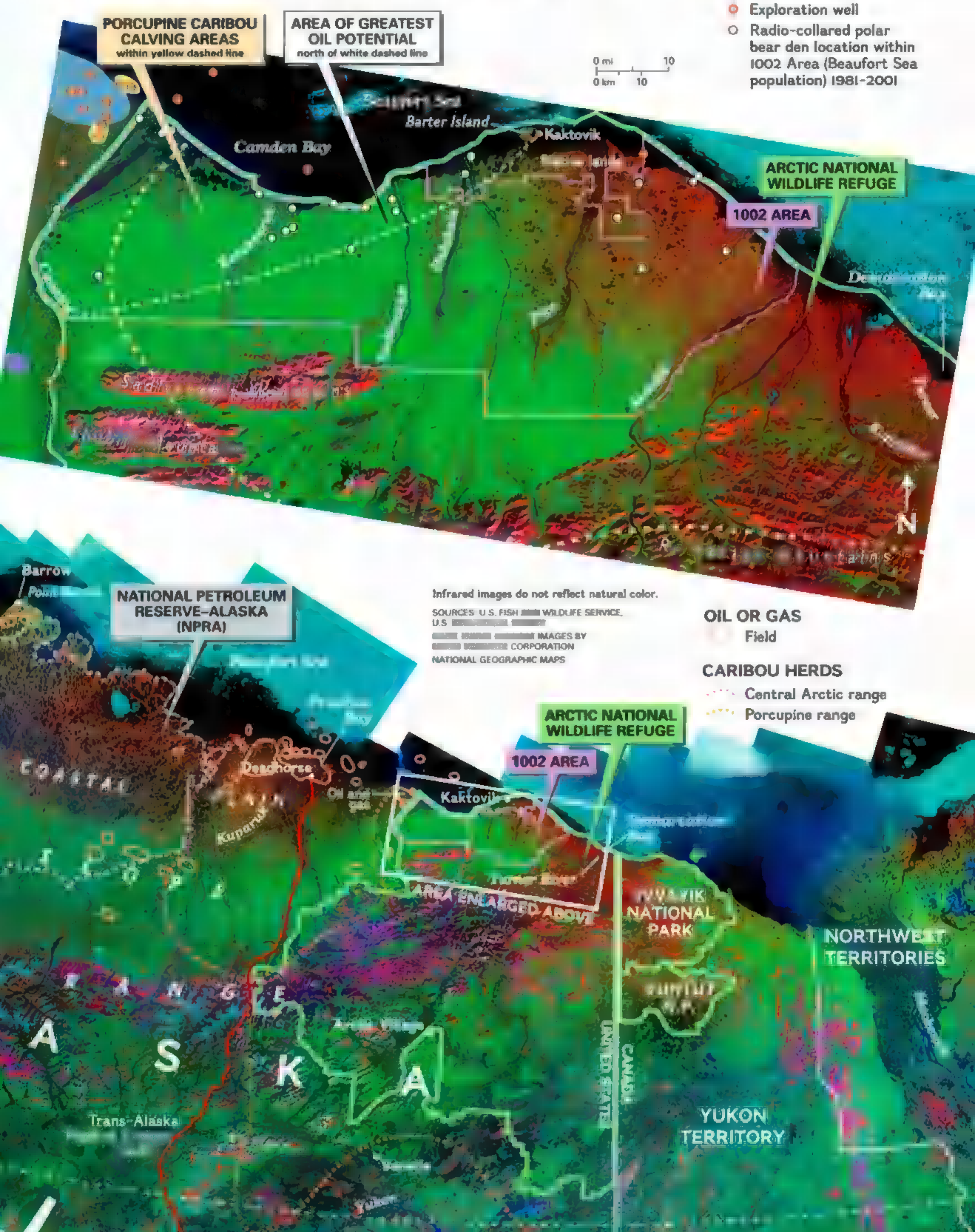
LAND OF PLENTY

Alaska's North Slope sustains a rich Arctic ecosystem, including polar bears, musk oxen, and several caribou herds. The region also holds plentiful fossil fuels. The National Petroleum Reserve–Alaska, set aside in the 1920s for its oil and natural gas potential, was reopened to exploratory drilling in the late 1990s. Prudhoe Bay, the largest oil field in North America, has long been the most productive on the North Slope, at its peak pumping two million barrels of crude a day south through the 800-mile trans-Alaska pipeline to waiting tankers at Valdez. Some claim that the western edge of the 1002 could contain a similar bounty.



A STRUGGLE OVER SACRED GROUND

The question of drilling in ANWR bitterly divides native peoples who have long had ties to the land. The Inupiat, who own territory within the refuge, stand to profit from drilling. But the Gwich'in, who rely on caribou for subsistence, fear that development would disrupt the Porcupine herd's calving grounds and annual migrations.



DISCOVERIES

- Gas
- Oil
- Oil and gas
- Exploration well
- Radio-collared polar bear den location within 1002 Area (Beaufort Sea population) 1981–2001

Infrared images do not reflect natural color.

SOURCES: U.S. FISH AND WILDLIFE SERVICE, U.S. [illegible]; [illegible] IMAGES BY [illegible] CORPORATION

NATIONAL GEOGRAPHIC MAPS

OIL OR GAS

- Field

CARIBOU HERDS

- Central Arctic range
- Porcupine range

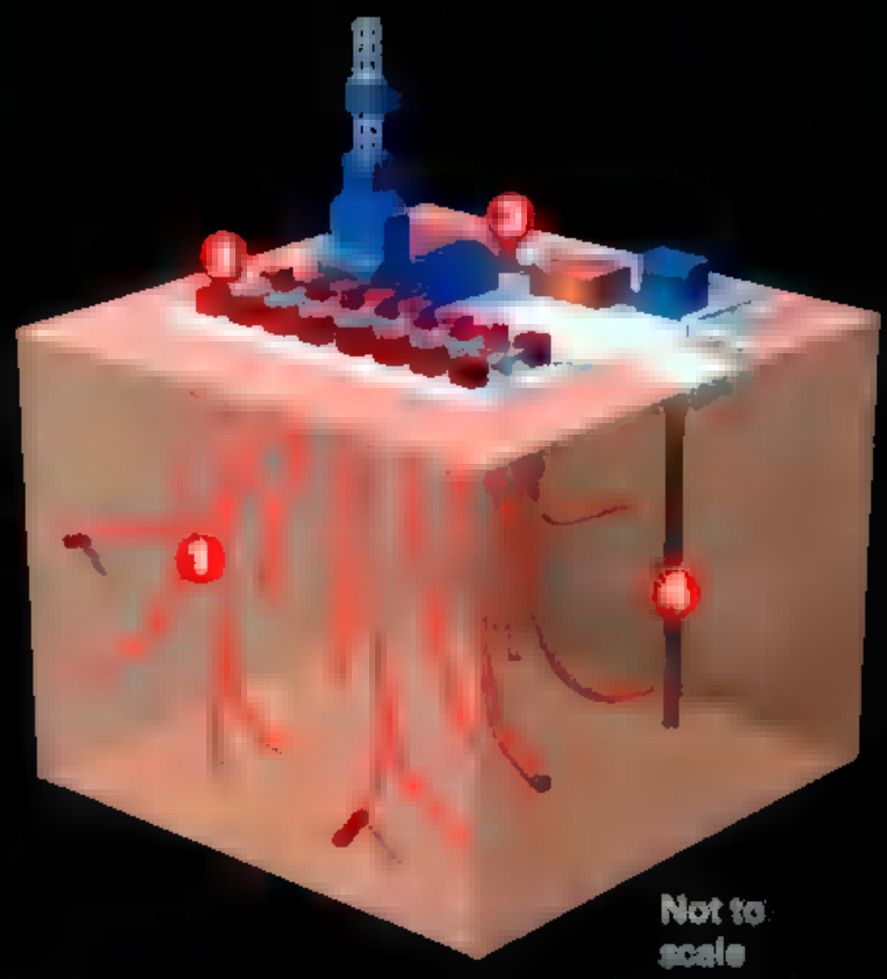
IF THERE IS ANY ISSUE more contentious than the amount of oil likely to be found beneath the coastal plain, it is the extent to which the infrastructure necessary to extract it—roads, airstrips, drilling pads—might adversely affect habitat essential to some 200 species of birds and mammals, including the barren-ground caribou of the Porcupine herd. Numbering about 130,000 animals, the herd traditionally migrates from scattered winter ranges in the boreal forests of Alaska and northwest Canada over the mountains to the coastal plain. There the pregnant cows drop their calves in an environment favorable for forage, relatively free of predators, and fanned by mosquito-repelling ocean breezes.

In the rhetorical wars between those who favor drilling the 1002 and those who don't, the caribou issue raises conflicting claims. Proponents point to the oil fields at Prudhoe Bay and Kuparuk, some 60 miles west of the refuge, where a different caribou herd, the central Arctic, has increased its numbers in spite of several hundred miles of gravel roads and more than a thousand miles of elevated pipe. Opponents respond that the industry's argument ignores a major difference between the two herds: The 1002 coastal plain provides calving habitat for a herd nearly five times as large as the central Arctic herd, in an area one-fifth as big. Some biologists fear development here could push caribou into the foothills, where calves would be more prone to predation.

Then there are the arguments over "footprints" (the area occupied by infrastructure) and the latest advances in drilling technology. Critics of the oil industry point to the sprawling development around Prudhoe and warn that it could happen again in the 1002. Whereupon supporters of the industry explain that development of the 1002 can be achieved with a total footprint no larger than that of a fair-size airport. But since the oil there is believed to be scattered in many small pockets rather than in one large pool, as at Prudhoe, environmentalists argue that the infrastructure would fall across the 1002 like a net. Most opponents of development, however, do concede that advanced technology—multilateral drilling and directional drilling that can reach farther out from a smaller drill-pad footprint—would help reduce the net's impact.

In the exploratory phase, the oil industry has

ART BY [redacted], JR., NGM ART; DATA AND MODELING: ENERGY INFORMATION ADMINISTRATION, WORLD RESOURCES INSTITUTE

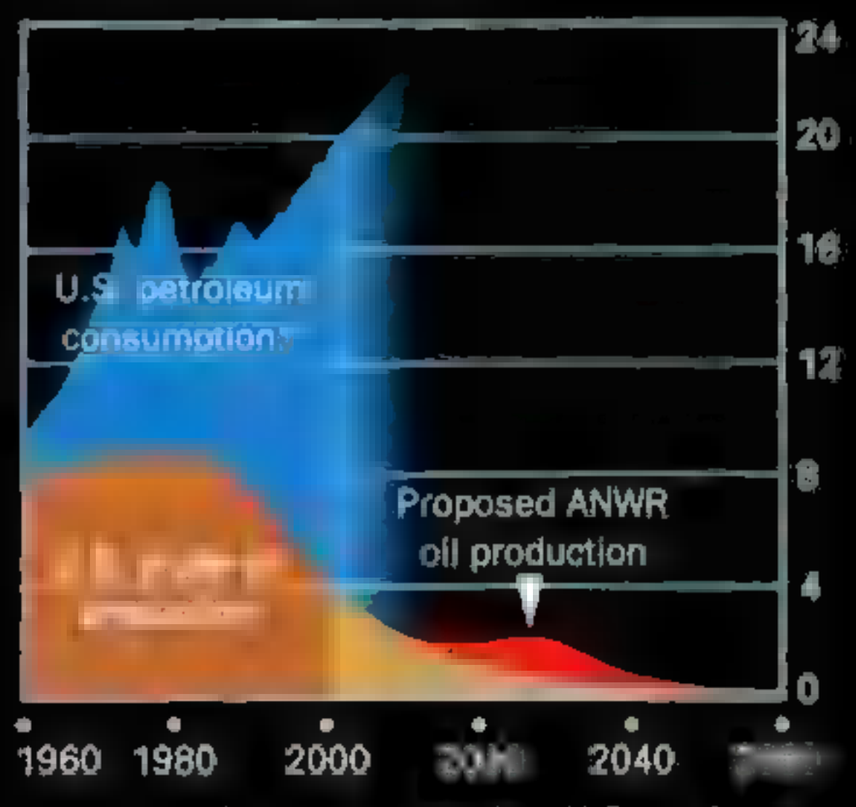


A LIGHTER TOUCH

Since [redacted] Bay was developed in the late 1970s, improvements in technology have reduced the environmental impact of oil extraction. [redacted] production pads on the North Slope (above) leave a smaller footprint than the old. From a single [redacted] multilateral drilling can tap more than one pocket, and directional drilling can reach oil deposits four miles away (1). The area occupied by wells (2) and drilling equipment (3) has shrunk by more than 60 percent. Instead of dumping drilling mud into surface pits, developers inject it back underground (4).

CRUDE REALITY

In millions of barrels per day



*Includes oil imports as well as U.S. crude and natural gas liquids

Using Energy Information Administration data, computer models [redacted] that the gap between petroleum consumption and crude oil [redacted] in the United [redacted] continue to widen. [redacted] ANWR's coastal plain holds ten billion barrels of oil, one model predicts that it [redacted] produce as much as 1.4 million barrels of crude a day for 30 years—about [redacted] same, some say, as [redacted] be saved with improved vehicular [redacted]. The nation uses 19.4 million barrels of petroleum every day.

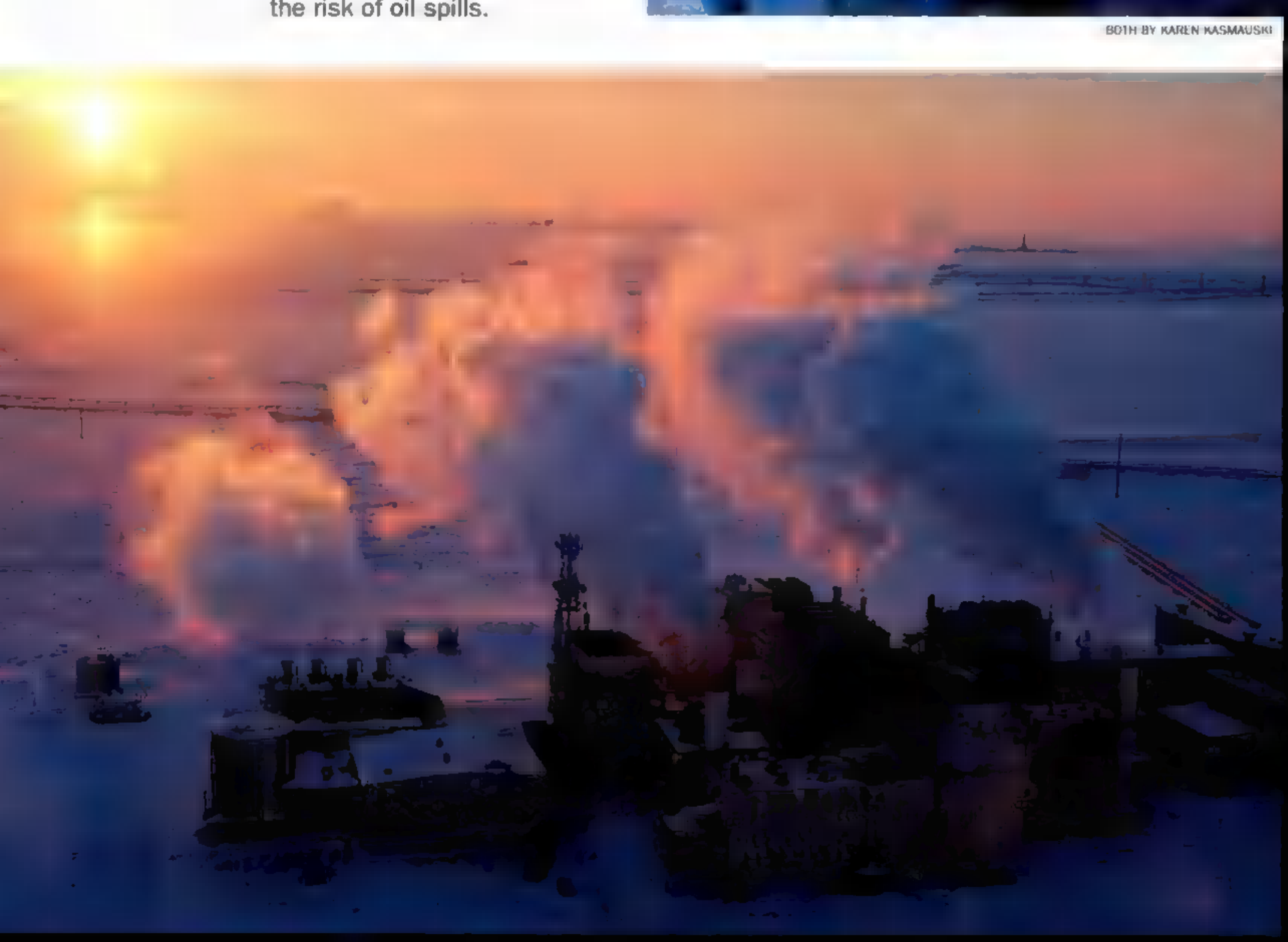
ENERGY QUEST

ADVANCING THE SEARCH FOR POWER

Pumping oil out of the ground and into gas tanks is easier and more efficient than ever before, according to the oil industry. Companies are no longer building immense oil-processing facilities such as those at Prudhoe Bay (bottom). Nearly all pipes are laid above ground, eliminating the need to tear up the land for repairs (below right), and many are being raised to accommodate local wildlife.

Finding crude has also become a more exact process. Geophysicists use 3-D seismic technology to produce images of the Earth's substrata. Sound waves pierce layers of soil and rock, resulting in computer data that reveal a three-dimensional geologic image. By pinpointing the location of oil deposits, the number of drill pads and supporting infrastructure is reduced. "It can be done in an environmentally thoughtful and careful manner," says drilling advocate Alaska Senator Frank Murkowski. Opponents claim that even with advanced technologies the process of extracting crude can still mar the landscape and introduce the risk of oil spills.

BOTH BY KAREN KASMAUSKI



said it could minimize impact by operating in winter on ice pads and over ice roads that disappear in spring thaws. But the Fish and Wildlife Service paints the coastal plain in winter as a virtual Arctic desert. Most lakes freeze to the bottom, and there's enough river water "to freeze into and maintain only 10 miles of ice roads." Moreover, while the Porcupine herd and migratory birds are absent in winter, a significant number of pregnant polar bears are denning in snowbanks along the 1002's coastal and riverine bluffs. The Fish and Wildlife Service reports: "Maternal polar bears with newborn cubs can be prematurely displaced from their winter dens by oil exploration."

FINALLY THERE IS THE CULTURAL and political landscape to consider, starting across the border. The Ottawa government strongly opposes drilling in the 1002. Two of Canada's wildest national parks, Ivvavik and Vuntut in the Yukon, abut the U.S. refuge and with it embrace the second largest internationally protected natural area in North America. The parks provide safe passage for the Porcupine herd to and from calving grounds on the coastal plain. Canada has banned industrial activity in both parks and expects the U.S. to do likewise in the Arctic refuge.

In Alaska most residents like living in an oil-enriched state, which, in lieu of levying an income tax, rewards each individual with an annual dividend from oil-lease revenues (last year's dividend came in at $1,964 per resident). Along with their governor, legislature, and congressional delegation, Alaskans for the most part are in favor of opening the 1002. Oil is a big employer in the 49th state.

The Native American community in Alaska, however, is deeply divided. South of the Brooks Range, in such places as Arctic Village and Venetie, the Gwich'in Indians view development of the coastal plain as a threat to the caribou herd that supplies them with much of their protein. Subsistence hunters from these and Athapaskan villages in Canada kill and use some 3,000 to 5,000 caribou every year. They view the coastal plain as sacred ground.

But north of the mountains, many Inupiat Eskimos in Kaktovik on Barter Island favor onshore oil leasing for the economic opportunities it might bring them—especially if oil

PROTECTION IN THE BALANCE

Low clouds shade the Arctic summer sun at midnight, dimly illuminating the mouth of the Turner River at Demarcation Bay. Farther inland a band of migrating Porcupine caribou glide through the refuge's fog-laden foothills. Shedding light on ANWR as more than "merely a cold barren land," says photographer John Dunne, heightens awareness of "this place worth knowing."

BOTH ■ JOHN DUNNE

is found on their coastal land. Inupiat subsist on caribou too, but they also have access to marine mammals such as seals and bowhead whales. The Inupiat view their offshore waters as sacred and oppose drilling there.

A new twist in the tangle of the 1002 developed earlier this year when electrical blackouts began to roll across California, and the Bush administration took that as further evidence that additional supplies of Alaska crude would be needed to avert a pending national energy crisis. But oil and diesel fuels generate less than one percent of California's in-state power; the top contributor, at more than 30 percent, is natural gas. So it was only natural that the nation's talk of supply and demand should suddenly shift from oil to gas. And there is plenty of gas on Alaska's North Slope.

According to a spokesman for British Petroleum, a principal operator on the North Slope, some eight billion cubic feet of natural gas is drawn from existing oil fields there every day and re-injected into the ground because there is no pipeline to carry the gas to U.S. or Canadian markets. Eight billion cubic feet of gas represents more than half of what residential consumers throughout the United States use in a single day.

There was talk of building a gas pipeline out of Alaska through Canada to existing lines in the U.S. even before oil began to flow down that other pipe from Prudhoe to Prince William Sound in 1977. But until recently the market price of gas wasn't sufficient to justify the construction cost, now estimated at about ten billion dollars. The price may be right today, given the growing need for gas in the lower 48. But construction could delay delivery for at least five years. Meanwhile, there are untapped reservoirs of natural gas in states that already have some capacity for delivery in place.

So the debate drags on. New estimates. New assurances. New alarms. And old uncertainties about the future of that coastal plain. □

MORE ON [illegible]

Weigh in on the debate over drilling ■ ANWR and find Internet resources at **national geographic.com/ngm/0108.**


Vapeurs organiques, gaz
Poussières
Organic vapours, Acid gases
Dust
0500
Air and with guts and a gas mask, explorer Franck Tamalet faces toxic steam from Kamchatka's volcanoes.

Russia's frozen inferno

Unable to resist the lure of big, bad eruptions, writer Jeremy Schmidt and photographer Carsten Peter journey to the Russian Far East for a closer look at the volatile Kamchatka Peninsula — one of the most volcanically active regions on Earth.

When the Georgian naturalist Georg Steller came to Russia's Kamchatka Peninsula in 1738, he got a much warmer welcome from the native Itelmen people. Having lived for untold generations in this land of smoke and fire, the Itelmens knew exactly how volcanoes work.

Eruptions were caused by gronds, they told Steller—ghosts of the Earth who lurked in volcanoes' subterranean craters. When hungry, they would leave their volcanoes and hunt the ocean for whales, grasping them with enormous, spear-tipped fingers and hauling them home to eat. Over huge bonfires the gronds

Feature portions
Lorem ipsum dolor
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of one of Mid
Hindley volcanic
active craters
Bromley pinks
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roasted mountains of whale flesh, sending clouds of smoke and vapor billowing up to the heavens. Rivers of boiling whale fat streamed down the slopes. The Earth shook, and whale bones flew through the air. Only when the gomuls were satisfied did the volcano fall back into steamy silence.

Steller, who later left Kamchatka to join Vitus Bering's second expedition to the North Pacific, asked how the Itelmen knew all this. They had found whale bones on the mountain slopes, they said. A few brave souls had even stolen to the rim of the crater, peered in, and seen the monsters' lair.

More than 260 years later the Kamchatka Peninsula is still a hot and shaky place, a 750-mile-long scimitar of land frequently jolted by eruptions—big, explosive eruptions—in a string of volcanoes that is one of the most volatile on Earth. Of Kamchatka's hundred-plus volcanoes, 29 are active. The largest, Klyuchevskoy, pours out an average of 60 million tons of basalt a year.

Late last summer I spent a month in Kamchatka stalking volcanic eruptions with a team that included French explorers Franck Tessier and Irène Margaritis, German photographer Carsten Peter, and a Russian guide named Feodor Farberov. Carsten—41, blond, and buzzing with energy—has spent his life documenting volcanoes with a camera. The closer he gets, the better he likes it.

Not so Feodor, a stolid, muscular, bearded mountaineer of 39. The son of two volcanologists, he was born in a village at the foot of Klyuchevskoy and grew up with the dangers and discomforts of volcano research. In the field "volcanic ash covered everything," he recalled. "Our water, our air, even our food tasted and smelled of sulfur." Having seen "enough eruptions for a lifetime," Feodor likes his mountains cold, quiet, and covered with snow for skiing.

Bezymianny, one of the dozen volcanoes that make up the peninsula's Klyuchevskoy group, was thought to be dormant until 1955,

Gas bubbles rise from a thermal pond in Uzon caldera, where volcanism is dormant—for now. On the far shore a ranger armed with a rifle keeps watch for bears.

SOCIETY GRANT

This Expeditions Council project is supported by your Society membership.

when it suddenly began to shake and swell and spew. On March 30, 1956, it exploded, enveloping the vicinity in a shroud of ash. Within two days the ash cloud reached Alaska, and two days later it was detected over the British Isles. The explosion flattened trees 15 miles away. Like Mount St. Helens, it started with a giant avalanche, then blew out sideways, leaving a yawning horseshoe-shaped crater.

Since 1956 Bezymianny has continued to erupt periodically, and when we started out to explore its blast zone, I found myself leaning toward Carsten's view of things. Echoing in my ears was the dinner toast we'd heard in the home of a Kamchatka scientist: "Please God, send to us the dreadful eruptions!"

We hiked through soft ash, sinking knee-deep at times, climbed heaps of shattered rock, and scrambled in and out of ragged gorges. Through wind and whipping clouds we climbed to the crater's broken rim and looked over. The inner cliffs dropped hundreds of feet to a circular channel ringing a new mountain rising from the ruins of the old—a huge dome of smoking rock, its summit towering above us.

On the floor of the channel sprawled a field of ice and snow blackened by cinders and split by crevasses that gaped white in the enveloping mists. As we clung to the sharp edge, the dome hurled showers of rock from its steep sides. When large boulders hit the ice below, they left white wounds in the dark surface.

Highest active volcano in Asia, Klyuchevskoy (below, at right) looms behind Kamen, center, and Bezymianny. Once thought dormant, Bezymianny exploded in 1956 and still smolders today.

One of Kamchatka's full-time volcanologists is Eugene Vakin. Much of his work has been on Mutnovsky, a complex structure with multiple active craters on a single massif. In March 2000, steam blasts rocked one of the craters while within it a glacier began to collapse. A large section of the glacier vanished, and a green acidic lake, 650 feet in diameter, appeared amid the broken ice. This kind of activity, Vakin told us, indicates that Mutnovsky is heating up and signals the possibility of even bigger eruptions.

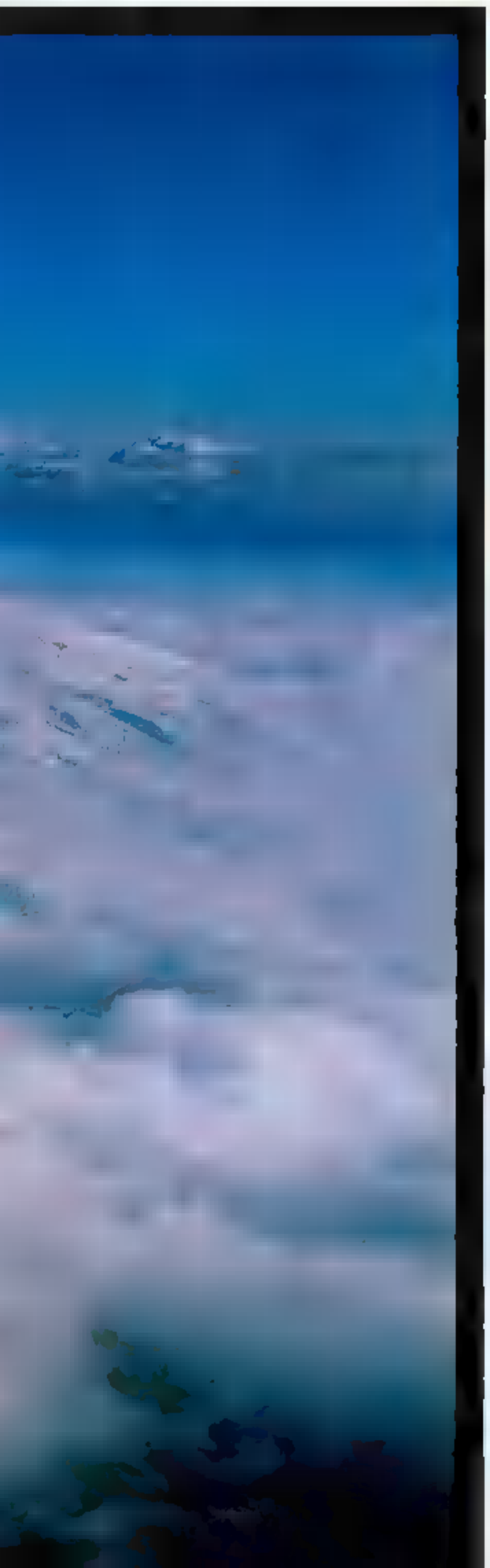
We set out just after dawn to follow a turbid river up into that crater. Our path led across slopes of wet, slippery ash, past fumaroles belching steam. Scrambling across the glacier, its surface a mass of dirty ice and cinders, we skirted the lake and climbed to a narrow divide. Standing on ice, we felt the hot breath of fumaroles; around us rose the steep crater walls lined with red and yellow deposits of crystalline sulfur. Slabs of glacier peeled off and crashed into the sour pea green water.

Carsten was ecstatic. When he and Franck decided to crawl under the glacier into a dark ice cave carved by a river of warm, acid water, I followed. Feodor just shook his head.

We crab-walked under huge blocks of ice that had fallen around the entrance, then waded through shallow water to the edge of darkness. Pale light shafted down from crevasses in the roof, barely illuminating a world of gray: gray shadows, gray ice, gray volcanic ash, gray river. The inner walls, scalloped by steam and flowing water, were hung with icicles.

The ice groaned above and around us—the internal workings of the glacier as it melted and moved. The hairs on my neck rose, and with them dreadful imaginings. Not only could the tunnel implode at any moment but also the lake, held back by only a wall of ice, could drain in a flash. It looked as if part of the cave had collapsed a few weeks earlier—what if another eruption, or even a slight earthquake, occurred while we were down there? As Carsten cheerfully put it, "The lake is above you, of course. You should feel as in a mousetrap."

As Carsten and Franck's flashlights winked out of sight ahead, I did what any prudent mouse would do. I made my way back to open ground and sat with Feodor on a dusty block of ice. Roiling sulfurous vapor filtered the sun with the hint of violence, a reminder that this peaceful afternoon was just a brief respite from the ongoing storm of rocks and fire. Feodor and I chatted about our lives and our families as the sun sank toward the crater rim. I was content just to be there, sitting on the sidelines as the gomuls did their work.



MORE ON OUR WEBSITE

Share Jeremy Schmidt's field notes and learn about volcano photography from Carsten Peter at **nationalgeographic.com/ngm/0108**.

PHOTO GALLERY

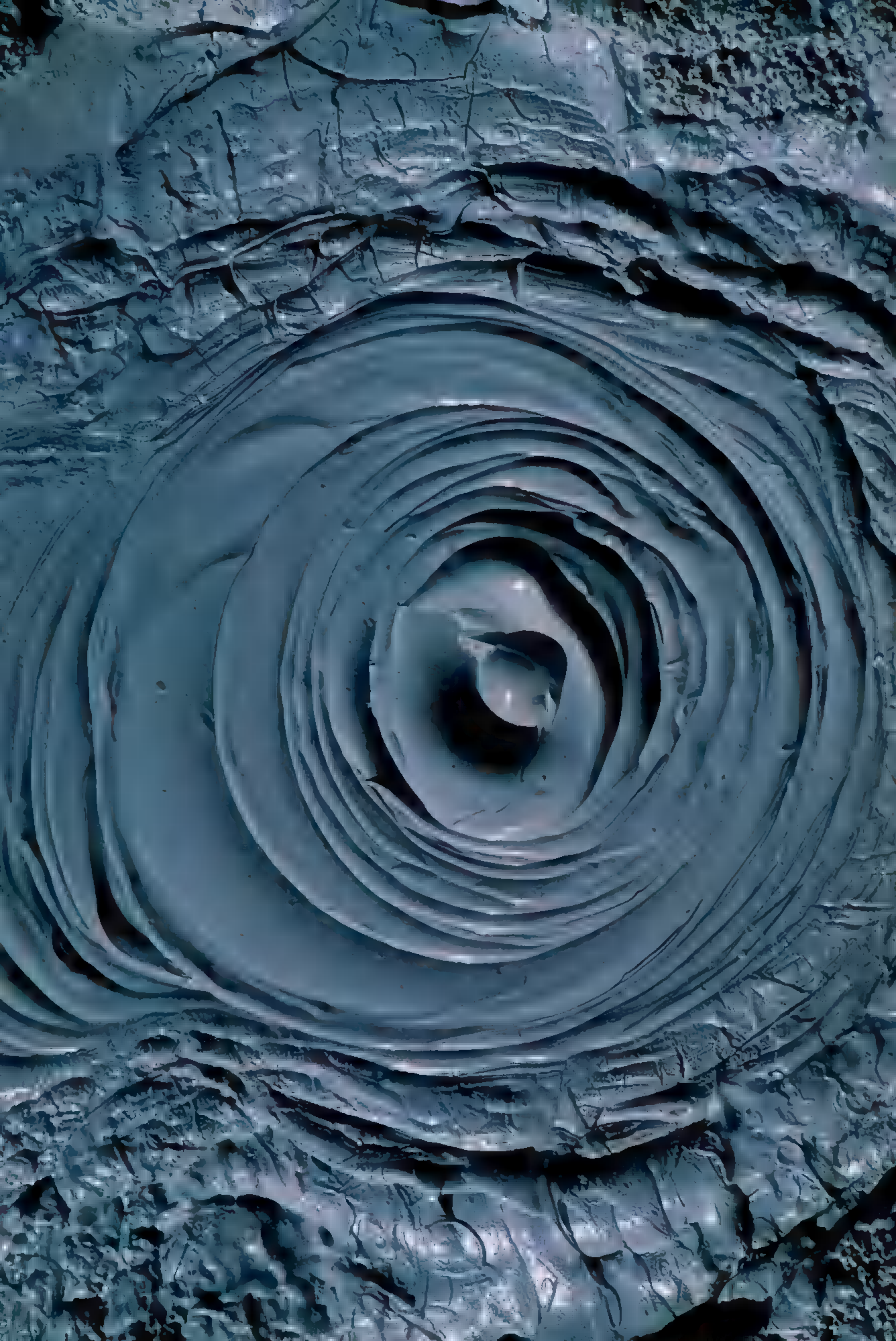
LIKE A VAT OF ACID,

the milky blue water in Maly Semiachik's crater lake may be corrosive enough to dissolve the seams of a rubber boat. So Tessier and team member Irène Margaritis wrapped theirs in acid-resistant PVC plastic and paddled carefully to avoid splashing. Taking to the air in a motorized paraglider, Carsten Peter cruised over ■ broad outwash plain (bottom right) between volcanoes near Klyuchevskoy. Buffeted by erratic winds, Peter crash-landed repeatedly but was unfazed. Setting out after a rain to explore the seracs and crevasses of Mutnovsky glacier, Tessier (below) found himself mired in a slippery gumbo of ash on the slopes of the volcano.

PHOTO GALLERY

SCALING SUMMITS OF ICE

in the badlands of Mutnovsky glacier, Tessier, at far right, uses crampons and ice axes to top a huge block and scout the way ahead. As thermal activity heats the ground below, this ice field melts and breaks apart into a constantly shifting obstacle course of unstable swales and crevasses.



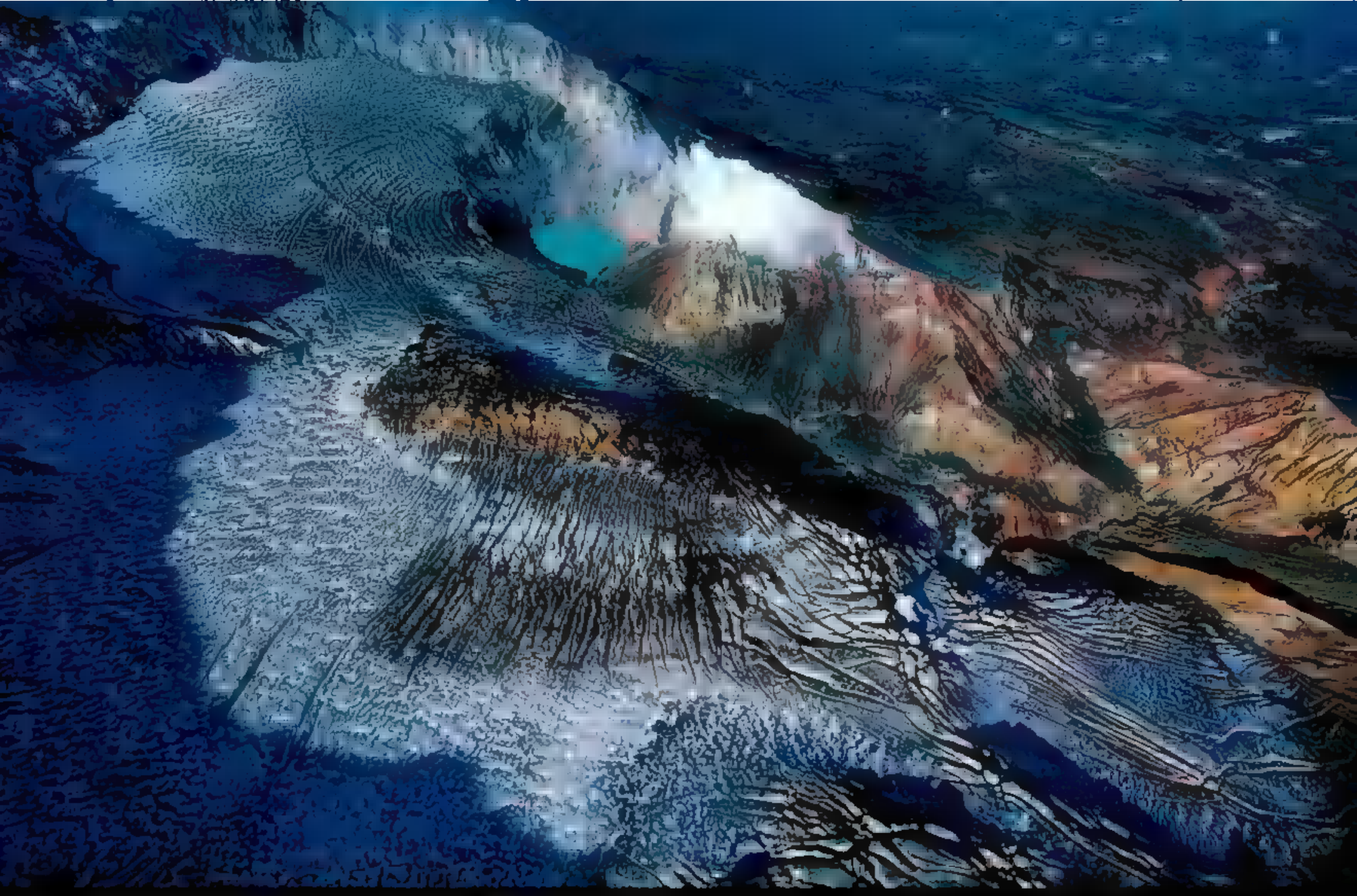
COOKING IN UZON CALDERA

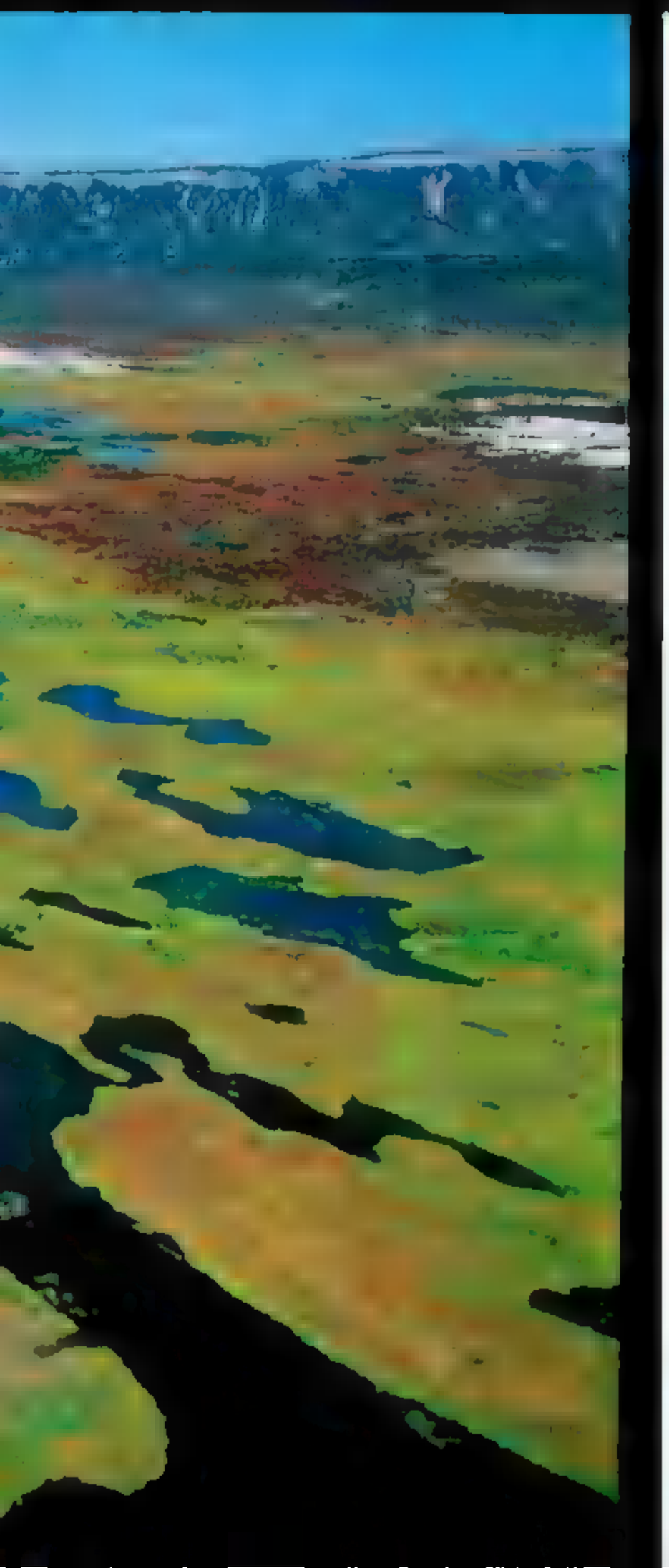
, a hot pool bubbles (opposite) as volcanic gas rises through ooze the consistency of chocolate pudding. Nearby, irregularities in a shallow streambed produce tiny wave patterns on the water's surface. Thermophilic, heat-loving, algae produce the stream's brilliant color.

PHOTO GALLERY

WINGS OVER KAMCHATKA

gave Carsten Peter a new perspective on Uzon caldera (below), a 40-square-mile depression left behind by a cataclysmic eruption 40,000 years ago. Besides marshy tundra, Uzon's hot springs and fumaroles form the centerpiece of Kronotsky State Biosphere Reserve, which includes the Valley of Geysers, the second largest geyser field in the world, after Yellowstone in the United States. In an Uzon hot spring, colonies of filamentous bacteria (bottom right) resemble a miniature version of snow-covered Mutnovsky (right), a complex massif with several active craters, one of which exploded in March 2000, melting part of a glacier and forming a crater lake.





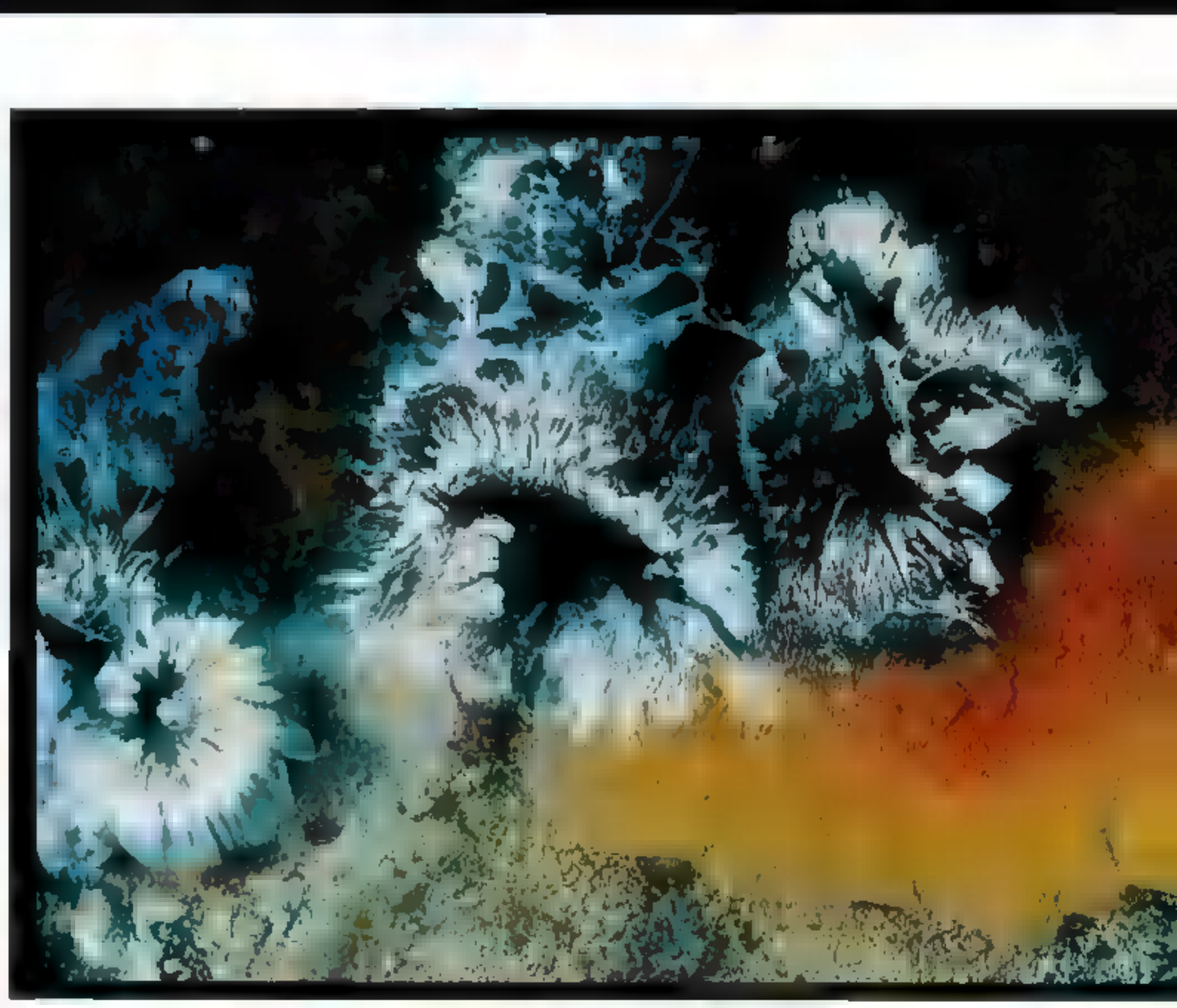


PHOTO GALLERY

PATCHED WITH DUCT TAPE,

this chopper made flying almost as scary as rappelling from a Corolla volcano crater, as Margarita and Jessica are about to do. "We asked the pilot if there was a problem," says author Jeremy Schmidt. "He said, 'In Afghanistan the blades were full of bullet holes, and we could still fly.'"


Breaking along a beach in Gabon, a forest elephant browses in an Ebyla preserve where buffalo, gorillas, hippopotamuses and leopards all have broken in the past. Determined to document the vanishing riches of central Africa before it's lost with plant ecologist J. Michael Fay completes a punishing 2,000-mile walk from Congo's deepest forest to Gabon's virgin shore

END OF THE LINE

MEGATRANSECT PART 3

BY DAVID QUAMMEN PHOTOGRAPHS BY MICHAEL NICHOLS

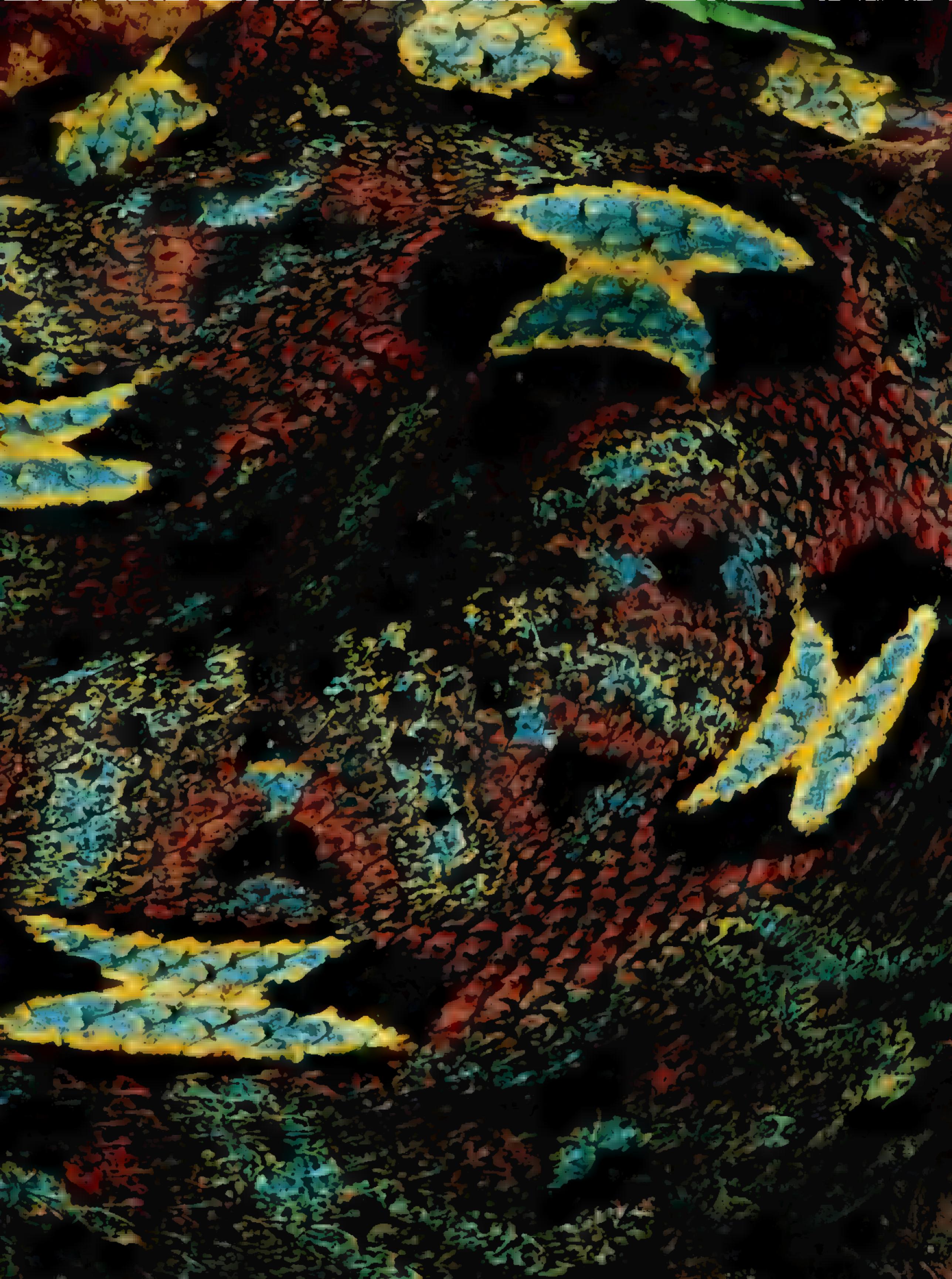
Unwitting crocodiles and other unseen dangers Sylvanus Eblack (right) plunges into a black-water swamp during the last days of Fay's relentless 15-month journey. In a moment of confusion Jean-Paul Ango followed chops at a tree to make a bridge, a rash —and rare—action out of step with the crew's standard practice of wading every swamp and stream in its path.

FIELD NOTES

BODIES OF WATER CROSSED:
2,000

DIRT ROADS CROSSED:
6

WE HAD LEECHES UNDER OUR SANDAL STRAPS, LEECHES BETWEEN OUR TOES, LEECHES RACING TO EVERY OPEN SORE. GOOD GRIEF, WHAT HAD THEY LIVED ON BEFORE WE ARRIVED?



As deadly as it is well disguised, a three-foot-long rhinoceros viper will ambush an unsuspecting BaYaka snake-stricken fear into the hearts of Baka Pygmies who believe that it was sent by a malevolent sorcerer who wanted them dead.

Fay grew isolated during the tense last leg of the trek as supplies dwindle and dense tropical forest bogs the team down. "When you get down on food, you can't afford to lose a day in the rain," he [illegible]. "And it's been raining every day." Weeks earlier the 13-man expedition nearly starved before reaching new supplies, surviving on one-third rations for the cook pot.

FIELD NOTES

GORILLAS SEEN IN THE JUNGLE:
200+

[illegible] IN THE JUNGLE:
5

"I FINALLY SNAPPED. I WENT INTO A TIRADE. WE HAD ONE WEEK TO GO. I WASN'T GOING TO PUT UP WITH ANY MORE BULL." —MIKE [redacted]

On the 453rd day of his punishing, obsessional, 15-month hike across the forests of central Africa, J. Michael Fay stood on the east bank of a body of water, gazing west. It was not the Atlantic Ocean. That goal, the seacoast of southwestern Gabon, the finish line to his trek, was still 20 miles away. And now his path was blocked by a final obstruction, not the most daunting he'd faced but nonetheless serious: this blackwater sump, a zone of intermittently flooded forest converted to finger lake by the seasonal rains. Soaked leaf litter and other detritus had yielded the usual tannin-rich tea, and so the water's sleek surface was dark as buffed ebony, punctuated sparsely by large trees, their roots and buttresses submerged. Submerged how deeply? Fay didn't know. Eighty yards out, the flooded forest gave way to a flooded thicket, a tangle of dense, scrubby vegetation with low branches and prop roots interlaced like mangroves, forming a barrier to vision and, maybe, to any imaginable mode of human passage. How far through the thicket to dry land? That, also, Fay didn't know.

"This is the moment of truth, I think," he said.

If it's only waist-deep, I said, with vapid good cheer, we could easily wade across.

"If it stays no deeper than *shoulder*," he corrected me, "we can make it." But he wasn't optimistic.

Fay took the machete of his point man, Emile Bebe, the young Baka Pygmy who had cut trail for him across hundreds of miles of Gabon. Slipping off his pack, wearing only his usual amphibious outfit (river sandals and river shorts), Fay waded out alone, probing the dark water ahead of him with a long stick. Bebe, two other walking companions—photographer Michael "Nick" Nichols, and a videographer from National Geographic Television, Phil Allen—and I stood watching him go. Quickly he was waist-deep, chest-deep, armpit-deep, groping with his feet against sudden drops, seeking the shallowest route. Then there was just a little head and two skinny arms vanishing into the thicket. I climbed onto a woody loop of liana against the base of a tree, putting me six feet above the water and better positioned to listen, if not to see. I was concerned for him out there alone because of the crocodiles—not just *Crocodylus niloticus* but also a smaller species found hereabouts, *Osteolaemus tetraspis*, commonly known as the dwarf crocodile yet not to be taken too lightly. Of course my concern was futile, I realized, since from this distance, perched like a parrot on a trapeze, I couldn't give any timely help if a croc did grab him. I heard the whack of the machete. I heard fits of cursing, which alternated oddly with what sounded like bursts of semidemented song. We waited. He was gone for a half hour, 40 minutes, longer.

Meanwhile, the rest of the traveling crew—two other Baka Pygmies and seven Bantu men, all carrying heavy packs of camp gear and scientific equipment and food, plus a middle-aged Gabonese forestry technician named Augustin Moungazi, whose role was to census trees—caught up and joined us at the water's edge. Where's the boss? they asked. Somewhere out there. The crewmen cast their eyes across the black lake with varying gradations of weariness and dread. Most of them had worked with Fay seven months now, since he crossed into Gabon from the Republic of the Congo, and they had been through such moments before. In the way they shrugged off their packs, uncricked their shoulders, inspected the route forward with leery scowls, they seemed to be saying: Oy, what manner of muddling travail gets us around *this* obstacle? It looked bad, but they had seen worse.

After nearly an hour I climbed down from my perch. Bebe smoked another cigarette. Nick aimed his Leica at anything remotely interesting. We swatted at filaria flies. We ate our crackers, nuts, and other piddling snacks representing lunch. We wondered silently whether Mike Fay would ever come back and, if not, how we'd find our way out of this forest without our mad leader. Then we heard shouts.

Fay had reached landfall beyond the thicket and returned just far enough to holler instructions. Mainly he was calling to the crewmen, in French, through the wattle of vegetation and the heavy equatorial air. Admittedly my French is lousy, Nick's and Phil's even worse, so we were befuddled; yet the Francophone crewmen appeared befuddled too. If we could just understand what Mike was saying, all of us, we would gladly comply. But to my ears, he sounded like a bilious colonel of the French Foreign Legion screaming orders at new recruits through a mattress.

He had been right, in some sense, when he called it a moment of truth. Whereas Fay had come to study the forest, I had come to study him, and adversity is a great illuminator of true character. But then again, *truth?*—it's a quicksilver commodity, not so easily gathered as data. The moment was still unfolding, and so far there was more confusion than illumination. Did he want us to come or to stay? If we should come, then *how?* Should we cut logs and build a raft, or just swim for it? The voice from the thicket seemed to convey almost nothing but purblind certainty and impatience. Was he mustering his troops for a final heroic lurch? Or, stressed by the long months of walking and the burden of forcing discipline on a group of freely hired men, by the nearness of the end, by his own ambivalence about reaching it, was he having a meltdown?

Days after this episode in the black lake, I would still be asking myself those questions. I would still be puzzling over the matter of J. Michael Fay and the complicated, provocative subject of leadership.

It was both the logic and the momentum of Fay's grand enterprise, which he had labeled the Megatransect, that had brought him and his entourage to this point of exigency on the 453rd morning. The logic was that he would walk a zigzag route from the northeastern corner of the Republic of the Congo to the southwestern coast of Gabon, a distance of at least 1,200 miles, passing dead center through certain vast blocks of roadless and uninhabited forest, gathering data on vegetation, wildlife, and forest condition as he went. The forest blocks, lying contiguous to one another, could be seen as gobbets of raw meat on Africa's last great kebab of tropical wilderness. Fay's route of travel was to be the skewer.

The momentum derived from 452 days of footslog persistence, including many swamps mucked across and creeks forded, many resupply problems, many hungry nights, many nervous elephants with half a notion to make Fay himself a kebab, many hours of campfire laughter and bonhomie with the crew, many explosions of anger, many points at which it seemed almost impossible for Fay and his comrades to go on, after which they went on. Fay's logic insisted that this gargantuan survey transect be continuous and unbroken, both in space and in time. There had already occurred one unavoidable gap, back in northwestern Congo just short of the Gabonese border, when he departed from his plotted line to evacuate a Pygmy crewman named Mouko, who was verging on death from hepatitis.* Although that short unwalked stretch—about 18 miles, which he called the Mouko Gap—continued to nag Fay with a slight sense of incompleteness, he had put it behind him, marching on. By now his momentum included so many miles traversed (more like 2,000, in fact, than the 1,200 originally planned), and so many crises passed, that it was unthinkable to be balked again, this time within 20 miles of the beach.

The logic of the enterprise had been laid out to the National Geographic Society (his main sponsor) and the Wildlife Conservation Society (his employer) in a 48-page prospectus, with the forest blocks and his route sketched onto a multicolored map. The blocks as he had delineated them numbered 13, beginning with the Nouabalé-Ndoki block in northeastern Congo and ranging southwestward from there. Last in the chain was the Gamba block, a cluster of faunal reserves and defunct hunting areas along the Atlantic coast that are now being organized by the Gabonese government, with help from the World Wildlife Fund, into a complex of protected areas intended to

*See "The Green Abyss," by David Quammen, NATIONAL GEOGRAPHIC, March 2001.

I HEARD FITS OF CURSING, WHICH ALTERNATED ODDLY WITH

preserve good habitat for elephants, hippos, dwarf crocodiles, and other sensitive species all the way to the beach.

Each of these blocks abuts another, and each is circumscribed by human impact (a road, rail line, a string of villages along a river) but—this is the crucial part—virtually free of such impact at its interior. Although some armchair experts find it hard to believe, there *are* still sizable patches of African forest not currently occupied by human beings. Fay's concept was to travel by foot with a small support crew through these forest blocks and to measure in multiple dimensions the relationship between such absence of human impact and the ecological richness of the forest.

He described this data-gathering mission as a "reconnaissance survey," to distinguish it from the more formalized procedure known as a line-transect survey, wherein a field biologist walks and rewalks a short, straight path through the forest, gathering accretions of standardized data with each passage. Instead of cutting a ruler-straight corridor, Fay had elected to use a "path of least resistance" approach, letting the contours and obstacles of the landscape nudge him this way and that against his general compass bearing, and to make a single 1,200-mile walk instead of, say, 1,200 one-mile laps up and down a familiar snippet of trail. "The path of least resistance has the advantage of leaving the forest intact after passage, a significantly increased sample size because of increased speed, and considerably reduced observer fatigue," he had written in the prospectus. During my own time on the trail with him, totaling eight weeks divided into four stretches, I sometimes recollected the irony of that phrase, "the path of least resistance." It sounded lazily sybaritic, whereas here we were, clambering through still another tropical brier patch and then waddling across still another floodplain of sucking mud.

Now again on the morning of Day 453, as I squinted toward that thicket across the black lake, somewhere amid which Fay was hacking branches and yodeling orders, I had cause to wonder: This is the path of least resistance? Thank God we didn't come the hard way.

Like an unnerving omen of things to follow, Day 453 had begun with leeches. We had spent the night at Leech Pond Camp, thus dubbed by me (I named all the camps, for mnemonic purposes) when Fay returned from his bath and reported that ten leeches had gotten to him while he was rinsing. Leeches in moderation are no big deal, since they don't hurt and don't generally cause infection or carry disease. But the leeches that greeted us in the pond on the 453rd morning were beyond moderation. They swam up like schools of grunion and hooked their thirsty little maws to our ankles and calves, a half dozen here, a half dozen there, resisting slimily as we tried to pull them off. We had leeches under our sandal straps, leeches between our toes, leeches racing to every open sore. Good grief, what had they lived on before we arrived?

Hopping from foot to foot in the shallows, we deleeched ourselves while Bebe, also dancing and snatching at his feet between machete strokes, felled a small tree to bridge the pond's deeper trough. Then we tightroped across, deleeched again on solid ground, and went on.

Within a few minutes we heard monkeys jumping through the canopy. Fay did his usual trick, a whistling imitation of the crowned eagle that provoked raucous alarm calls *(kaa-ko! kaa-ko!)* from the monkeys, allowing him to identify them: *Cercocebus torquatus torquatus*, the red-capped mangabey, locally known as the *kako*. He scribbled the exact time and the species name into his notebook, then took a five-minute sampling of their vocalizations on digital audio. Earlier he had mentioned that this mangabey species, with its unmistakable carroty crew cut, was native only to forests near the Atlantic coast; back farther inland, while crossing Congo and eastern Gabon, he had seen plenty of gray-cheeked mangabeys but none of the red-capped. Now here they were, offering a welcome signal that we had entered the coastal zone.

After an hour of easy walking along elephant trails, we found ourselves blocked by another dark pond. "Bad news, boys," said Fay. It looked as though the rainy-season waters were still up, he explained, suggesting that there might be

many such fingers of flooded forest between us and the coast. "If that's the case, we ain't gonna get through." But with a little scouting we found a fallen-tree bridge across the deep part, and from there waded to dry land.

At the edge of the water stood another tree, a towering hulk with shaggy bark, gracefully tilted trunk, and wide-reaching buttresses. Fay's routine called for noting every major tree along the route, so this one went into his little book: *Sacoglottis gabonensis,* 1.5 meters diameter. Loggers generally ignore the species, he had said earlier, because its ropy, twisting trunks don't yield good lumber. The increasing abundance of *Sacoglottis gabonensis* was a further indicator that we were nearing the coast. Still another was *Tieghemella africana,* a tree of high value both to timber companies and to elephants. Known commercially as *douka,* it grows to magisterial sizes—six feet in diameter and crowning out through the canopy—with straight, clean trunks, offering lovely wood for the sawmill. It also produces big green fruits, globular and heavy, each filled with sweet-smelling, pumpkiny orange pulp—not bad but a little chalky, to my taste. Elephants travel considerable distances to scarf douka fruits when they're ripe and falling, and the well-worn elephant trails we'd been following ourselves seemed to run like traplines from one douka to another. Take away those mature, fruiting trees (by selective logging, for instance) and the local elephant population would lose part of its seasonal diet. But for now the grand old doukas were still here, showing evidence of recent attention (fresh elephant dung, gnaw marks in the bark), and so were the elephant trails. We hit another short stretch of good walking, then heard another group of monkeys.

This time, in response to the eagle whistle, there came a low, grunting chortle: *chooga-chooga-chooga-chooga-chooga.* Having heard it many times over the months, even I could recognize that as the alarm call of the gray-cheeked mangabey, *Lophocebus albigena,* another species dependent on fruiting trees. "It looks like the old gray-cheeks are gonna make it to the beach after all," Fay said. "That's cool. I was a little worried, 'cause we hadn't seen them for three or four days." The presence of *Lophocebus albigena,* overlapping here with its red-capped cousin, became another notebook entry. Then again we walked—westward, toward the beach—but only for five minutes, until the black lake stopped us cold.

The black lake: too wide to bridge and too long to bypass. According to Fay's map, it led northward into the Rembo Ngové floodplain, a riverine morass we didn't care to enter. So Fay had gone straight across, on his solitary probe, and was now out there somewhere in the thicket shouting back instructions. Jean-Paul Ango, one of the youngest and strongest of the crewmen, took his machete to a modest-sized tree, which fell pointlessly into the water near shore. That can't be the idea, I thought.

Impatient with this muddle, I waded out along Fay's route to see if I could find the shallow ridge on which he seemed to have walked. Quickly I was neck-deep. So I decided to swim. Another crewman, Thony M'Both, took the same notion at the same time, and we breaststroked across the black water on converging lines toward the thicket. Soon most of the crew had followed, some confidently, some reluctant to swim but more reluctant to be left behind. Strung out like a line of ducklings, they floundered variously with their waterproof packs, which were buoyant but too cumbersome to serve as water wings. Reaching the face of the thicket, Thony and I stopped. We treaded water. There seemed nowhere to go. I climbed up onto the buttresses of a half-drowned tree, and one by one the others did likewise. In a neighboring tree I noticed Jacques Bosse, a big square-shouldered Bantu whom Fay had hired out of a gold-digging camp in northeastern Gabon. With a forceful yank, Jacques hoisted up his pack, to the outside of which was tied a large cook pot. He tossed back his head and muttered disgustedly to the sky that this was *no* kind of work for a man. We were stuck there, treed and frazzled like cats in a Mississippi flood, when Fay came out of the thicket and resumed command.

His first act was to holler sternly at Emmanuel Yeye, the shyest of the Pygmies, for letting his pack soak in the water rather than pulling it up. This gave way to a scathing harangue against the whole crew. *(Continued on page 94)*

Towering 200 feet above Satchmo, the kapok is one of Africa's largest tree species. Drawn to its bark, perhaps 20 generations of elephants have visited such trees, Fay says, leaving companies of bird commensals for at least part of each year. Dots along Fay's route (map) represent sites to catalog flora and fauna behind it; too late, Fay (below left) missed this one-hour rainbow with animal encounters, bird's-eye views, and other sights and sounds.

FIELD NOTES

INITIAL DISTANCE ESTIMATE:
1,200 MILES

ACTUAL MILES WALKED:
APPROX. 2,000

A JOINT PROJECT OF THE WILDLIFE CONSERVATION SOCIETY AND THE NATIONAL GEOGRAPHIC SOCIETY

On night patrol near the beach, a leopard searches for bushpigs and other prey along a huge elephant trail. Although leopard tracks appeared in many places along the Mbirimoune, no footprints were ever encountered by Fay or filmographer Michael "Nick" Nichols, who surprised this female and a pair of elephants (top) with a remote camera.

FIELD NOTES

MILES WALKED ON ELEPHANT TRAILS: 1,000

PILES OF ELEPHANT DUNG RECORDED: 20,000

"THE ELEPHANT TRAILS WIDENED, AND WE GOT INTO THAT KIND OF FOREST YOU SEE IN TARZAN MOVIES."

...off after a long day when tempers flared, Sophiano soaps up while Celestin Ipenda cleans salted fish for dinner. ... tensions, "The thought of the end ... sad for ... Too Close enough now to hear the ... which half of them have never seen, the men rally.

"IN FIVE TO TEN YEARS THIS PLACE WON'T BE WILD ANYMORE. LOGGING IS SUCKING THE LIFEBLOOD OUT OF THE FORESTS." —MIKE FAY

Puffed up to protect its turf, a four-inch-long mudskipper (left) lunges at a rival fish, its blue dorsal fin raised in warning. Nearby, a young Nile crocodile slips peacefully through a brackish estuary in a Gabon coastal reserve. Such refuges exist or have been proposed in all but one of the Mega-transect [illegible]. But time is short to protect [illegible] "We could feel the doors closing behind us as we [illegible]," Fay says.

FIELD NOTES

[illegible] AREAS FOR NATIONAL PARKS IN [illegible]

EXISTING NATIONAL PARKS:

signed for another stint on the understanding that he'd go to a new national park in the Central African Republic, near its borders with Chad and Sudan. The park, known as Manovo-Gounda St. Floris, was then just wishful lines on a map. The lines encircled an area rich with elephants, black rhinos, and other big mammals, a vast region of savanna over which the government exerted virtually no control. This was where Fay began to—what's the right phrase? *Go AWOL? Step off the ranch? Disappear into nowhere for long periods?*—let's say *leaven* his more focused scientific work with wildcat exploratory journeys. He had a Suzuki 125 trail bike from the Peace Corps, and, since the park's landscape was flat, he began putting the vehicle to unauthorized use.

"I decided that the way to really see that place was to take long traverses from one road to another, sometimes 70 or 80 kilometers across the places where no one had ever been." Too many field biologists, in his judgment, never venture far from their base camps. Fay rejected such tethering; he hungered to see the wider scope and the interstitial details. He would load the bike with extra fuel, a patch kit for flats, two weeks worth of food, and go.

The Suzuki was a convenience soon discarded. Beginning in the late 1980s, when he did his doctoral fieldwork on lowland gorillas, tracking them through the forest with a Pygmy mentor, Fay developed a habit of making his long, restless explorations by foot. He discovered that by adapting his body and his outfit (river sandals, one pair of shorts, and no shirt, since bare skin is more easily washed and dried than clothing) to local conditions, he could cross flooded forests, streams, boggy clearings, and swamps that most other people considered impassable. He also learned he could walk into a village or town virtually anywhere in central Africa and, within a day or two, hire a crew of men who were glad for the work of carrying bags and making camps. Employment was scarce, and he paid better than most. He learned how many men were required for transporting this much scientific equipment, that many tents, and enough food to sustain them all for, say, 20 or 25 days between points of supply. By trial and error he developed a style of personnel management that worked.

One element of that style was his imperious sense of command. Another was that he never asked any crewman to accept discomfort or risk that he wouldn't accept himself. The historian Plutarch, in his life of the Roman general Marius, wrote that "there is nothing a Roman soldier enjoys more than the sight of his commanding officer openly eating the same bread as him, or lying on a plain straw mattress, or lending a hand to dig a ditch or raise a palisade. What they admire in a leader is the willingness to share their danger and hardship, rather than the ability to win them honour and wealth, and they are more fond of officers who are prepared to make efforts alongside them than they are of those who let them take things easy." In Fay's case, it was manioc and salted fish, not bread; a roll-out pad on the forest floor, not a straw mattress; and a machete-cut corridor through a blackwater thicket, in lieu of a raised palisade.

When I asked him later about his blowup at the black lake, he conceded that "it certainly looked like I was pissed off, there's no doubt about it." And yet he hadn't been, he said. It was just another bit of tactical histrionics. From his perspective (though he was too discreet to say so), I had exacerbated the confusion myself when Thony and I triggered the group swim. He had intended to proceed methodically, but my impatience foiled that. "I was simply taking chaos and putting order into it. And the only way to do that is to say, at the top of your lungs, 'Everybody *stop!* Everyone who is here present *stop!* Do not move. Do not breathe. Stop. And I'm going to tell you what to do.'"

Fair enough, though I didn't wait to be told. I swam back to the east side of the lake, found my own waterproof pack where I'd left it, double-checked its seal for the sake of my notebook and binoculars, and swam out again to the thicket. By the time I got there, nudging the pack ahead of me like a water polo ball, the others had begun moving down Fay's corridor. The water here seemed to be eight or ten feet

MORE ON OUR WEBSITE

Mike Fay and photographer Nick Nichols narrate a multimedia retrospective of the Megatransect at **national geographic.com/ngm/0108**.

deep. I fell in with Sophiano Etouck, one of the most stalwart of the crewmen, and Nick, who was managing somehow to dog-paddle along with his pack on his back and his Leica to his face like a snorkel mask. Sophiano led the way, swimming with his right arm and wielding a machete with his left. Every few yards he rose high in the water to whack a limb out of our path, then sank away beneath a boil of bubbles. When Sophiano first went under, and stayed under, Nick and I both worried that he had tangled himself in some vegetation; then, exuberant as an otter, he exploded back up to take another swing. I followed him for 50 yards through this watery tunnel of limbs and roots, a passable route that Fay had opened during his missing hour. Finally the thicket cleared, the water shallowed suddenly, and we climbed up a high bank onto firm ground.

WHILE NICK AND PHIL examined their cameras for damage and their bodies for leeches, I dropped my pack and went back in the water to see if I could help with another load. After swimming down one blind alley, I found the tunnel again and retraced it to the east edge of the thicket. Fay was there, still perched in a tree, having meanwhile swum the lake to retrieve his own pack.

Now he was shepherding along the last of the crew. He knew, from experience, which of the men were steady swimmers and which needed assistance. He was giving instructions, but the strident moment had passed. In fact, he seemed subdued. I took the pack of Augustin, the botanist, who preferred climbing through the thicket to swimming under it, and Fay came behind all of us as sweeper. He even brought my sleeping pad, which had gotten unloaded during some emergency reshuffling of the packs and been temporarily stowed in a tree. He handed it back to me dry.

By 12:40 p.m. we stood on the west bank, wringing out our shirts (except for Fay, still shirtless), checking our packs for leakage, basking in the sunshine—rare sunshine!—that blessed us there through a canopy gap. Flush with nervous relief, we joked and relaxed. We were pleased with ourselves for having wiggled through what might be, we hoped, the last of the dire obstacles. Emmanuel lifted a sodden ten-pound bag of rice from his pack, letting the pale milky water drain out. Nick labeled rolls of film. Sophiano had a smoke. Fay, head down, quietly wrote in his yellow waterproof notebook.

And then, without comment, without any speech of further remonstrance let alone congratulations, Fay detached himself crisply from our breezy mood. He glanced at his wrist compass. He turned toward the forest and stabbed out his arm, giving the usual signal to Bebe: *That* way. Dutifully, Bebe stepped out and began blazing trail. Fay walked.

Snatching up my pack, holstering my notebook, I followed. I was startled by his brusqueness, but I wanted to stay at Fay's heels. Maybe, in the aftermath, he would loosen up and commit a personal revelation. Maybe he'd put his outburst in context. Or maybe he'd just encounter something interesting—a Gaboon viper, a gorilla, another crocodile—that I'd hate to miss. The rest of the party were left behind to think what they might think, to feel what they might feel, to gather themselves at their own pace.

At 1:11 p.m. on Day 453, Fay paused to record the next datum: elephant dung, old. Then again, without speaking, he walked. A hard man, a savvy leader, a flouter of pieties, a solitary soul, a conscientious scientist, a fierce partisan of tropical forest, a keen judge of human limits, he had work to do—not much work remaining now, but some. He couldn't celebrate yet. He was still three days from the beach.

At 12:39 p.m. on December 18, 2000, J. Michael Fay and his support team broke through the forest onto the beach at the Atlantic Ocean. "Wow," he said. "Wow." Then, matter-of-factly, "This is just where I wanted to come out." It was Day 456 of the 2,000-mile Megatransect, an exploration of historic proportions. We will return to the story in a future issue, to report about the wealth of biological information Fay collected and how it is being used—and to keep track of Mike Fay himself.

After months of imagining the ocean, Fay's crew reaches the beach at 12:19 p.m. on day 456 of the expedition. "Going to the Ubundu was as exotic for the Baka Pygmies as it would be for an American to go to Saturn," Fay says. Cooled by the water's color, Fay dips in a finger to see if this gigantic river, as he calls it, is as salty as he has been told. Then he retreats to safer ground. "To the Pygmies a place without fresh water was a place where humans would not live. They didn't want anything to do with it."

Eyes perched high on stalks allow ghost crabs to watch for predators even while scuttling through sea foam. After several days starts at digging a nest, a six-foot-long leatherback turtle lays her eggs at midnight. Five of the world's seven species of sea turtles come to this remote coast, making it one of Africa's most important sea turtle nesting grounds.

FIELD NOTES

BUFFALO, ELEPHANT, HIPPO TRACKS ON BEACH
INNUMERABLE
HUMAN FOOTPRINTS:
NONE

"THERE WILL NOT BE A DAY FOR THE REST OF MY LIFE THAT I DO NOT THINK OF THIS PLACE. I FINALLY FOUND HERE WHAT I HAD BEEN LOOKING FOR ALL MY LIFE." —MIKE [redacted]

As wild a [illegible] as any in [illegible] Gabon's [illegible] Reserve (above) encompasses [illegible] savanna, [illegible] forest, and Atlantic [illegible] left undisturbed by humans, hippopotamuses venture into the [illegible] mate [illegible], plus or merely commute from lagoon to savanna, getting a lift from the [illegible] water rather than toiling on land.

FIELD NOTES

PERCENT OF [illegible] FOREST TARGETED FOR PROTECTION:
10

PERCENT OF FOREST LEFT VULNERABLE TO [illegible]:
90

As Sophiano does a virtuoso flip, Fay is overwhelmed by the journey's end. "We had come so far, for so long. It had become a way of life," he says. Reluctant to leave the place he so loved, Fay lingered on the beach for days. "I would gladly have turned back and done it all again."

France's Magical
Ice Age Art

Chauvet Cave

BY JEAN CLOTTES
DIRECTOR, CHAUVET CAVE RESEARCH

CHARGING RHINOCEROSES, thick-maned horses, bisons, lions, and a herd of long-horned wild oxen called aurochs transform the 27-foot-long Panel of Horses into a tour de force of acute observation and exquisite rendering. Roughly twice the age of the images in the famed caves at Lascaux and Altamira, Chauvet's paintings are among the oldest ever discovered.

MOREL

MINERAL-STAINED LIMESTONE CLIFFS along the deep gorge of the [illegible] River in southwest France have long attracted cavers eager to explore its uncharted crevices. Here in 1994 three spelunkers found deep chambers filled with paintings, engravings, and drawings created some 35,000 years ago. The age and sophistication of these images are radically revising ideas about the beginnings of art. Six members of my study team, seen above on their way to the cave, work to understand the artists' creative process.

A CAVE LION—an extinct mandible species—seems to sniff the hindquarters of a crouched and snarling companion. The two may represent a mating pair. Seventy-two felines appear on Chauvet's walls, along with portraits of more than a dozen other species—420 animal figures in all—that shared the Paleolithic landscape with Homo sapiens.

Art this old was supposed to be crude and stiff,

The Pont d'Arc (above) has spanned the Ardèche River for at least 500,000 years. In its rough contours prehistoric people may have seen the arched belly and left-facing head of an animal, perhaps a mammoth or a bison. With a giant limestone beast guarding it, mythic significance seems to permeate this valley: About two dozen decorated caves have been found here since the end of the 19th century. Yet compared with the 20,000-year-old images at Lascaux or the 17,000-year-old creations in Spain's Altamira, the art of the Ardèche received scant media attention —until the discovery of Chauvet Cave in 1994.

The first photographs captivated specialists and the public alike. For decades scholars had theorized that art had advanced in slow stages from primitive scratchings to lively, naturalistic renderings. Surely the subtle shading, ingenious use of perspective, and elegant lines of Chauvet's masterworks placed them at the pinnacle of that progression. Then carbon dates came in, and prehistorians reeled. Approximately twice as old as those in the more famous caves, Chauvet's images represented not the culmination of prehistoric art but its earliest known beginnings. A few thousand years after anatomically modern humans appeared in Europe, cave painting was as sophisticated as it would ever be.

We have 30 radiocarbon datings so far, more than any other rock-art site. These show humans using the cave 32,000 radiocarbon years ago, an estimated 35,000 calendar years; 17 directly dated artworks were created at that time. A second round of visitors entered about 6,000 years later, whether to look or to paint we do not know.

EVELYN BILLO AND ROBERT MARK, RUPESTRIAN CYBERSERVICES

but there is nothing primitive about Chauvet.

Recognizing an extraordinary opportunity, the French Ministry of Culture committed to support investigation of the cave by an entirely professional team, a first for a rock-art site. Two years and about two million dollars were required to widen the narrow entrance, install a security system, and prepare a staging area, all without altering the cave's delicate environmental balance.

A dozen of us study the art on the walls and the human and animal traces on the ground. Experts in dating, pigment analysis, animal behavior, and other disciplines assist us, visiting the cave as necessary. We also benefit from the advice of senior specialists in rock art from ten different countries. Twenty-eight authors, including geologists, archaeologists, anthropologists, biologists, and art historians, joined me to produce the first book on the project.*

People never lived in Chauvet. Prehistoric master artists, children, perhaps ritual participants—all came to experience the power of this subterranean sanctuary. Then part of the cliff above the original entrance collapsed, sealing the cave and preserving the brilliant works within.

**La Grotte Chauvet: L'Art des Origines* was published in May 2001 by Editions du Seuil, Paris.

CHAUVET CAVE

Careful preservation makes analysis possible.

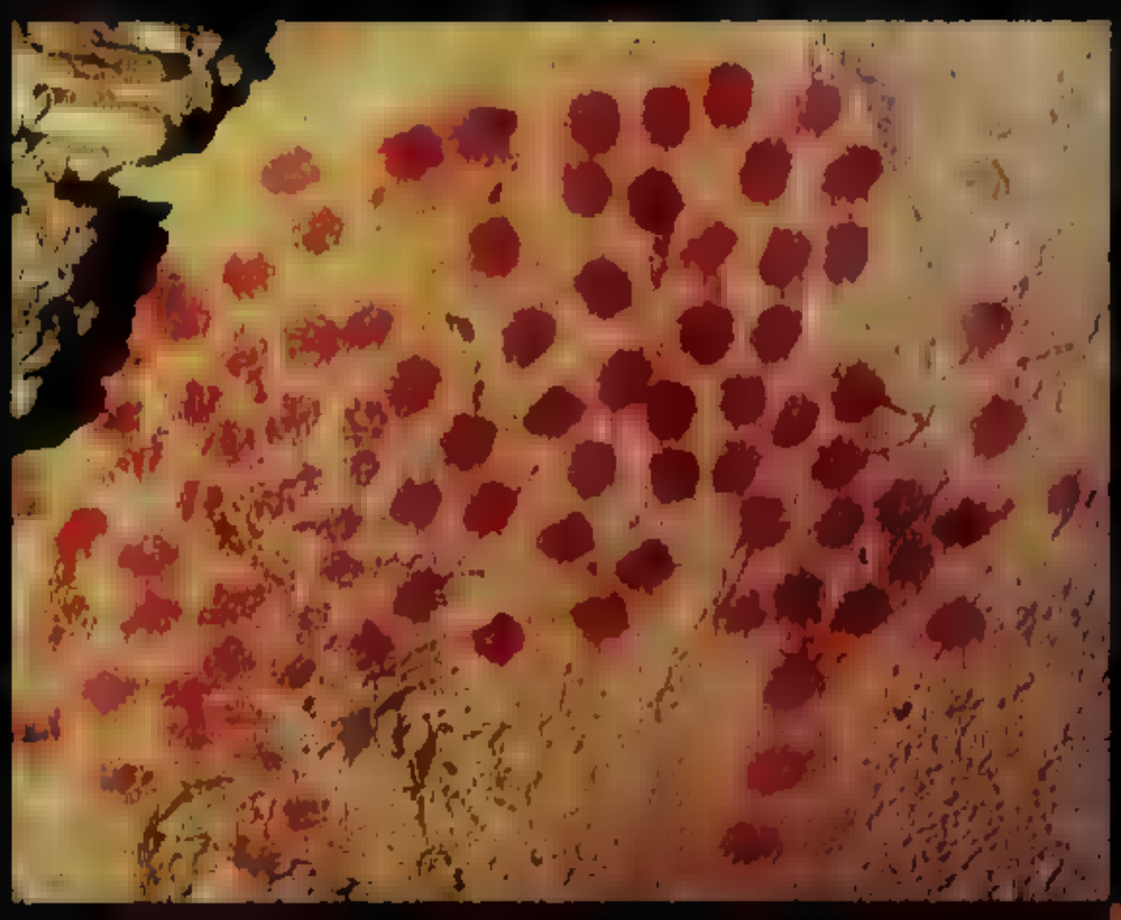
COLD AND DAMP, Chauvet's stable interior climate—56°F, with [illegible] humidity—helps account for its remarkable state of preservation. The [illegible] Pont-d'Arc in Ardèche Gorge [illegible] from [illegible] Carole [illegible] and Gilles Tosello [illegible] also [illegible] entrance red iron oxide [illegible] lodging bear and dwelling, trunk [illegible] the outline of a drip, a rock [illegible] mammoth. [illegible] preserve traces of Chauvet's past. [illegible] bears [illegible] den, [illegible] and deep [illegible]. They died [illegible]. We have counted 147 skulls. A preliminary [illegible] that set the bear skull on a rock slab that had fallen from the ceiling. Cave [illegible]. A fire was built on the rock; charred [illegible] under the skull date from 35,000 years ago. We are able to recover such detail [illegible]

CHAUVET CAVE

discoverer Jean-Marie Eliette Brunel and Christian Hillaire (honored in the names of two chambers) avoided disturbing floors and other surfaces. A replica of Chauvet built in Ardèche will to the art in context without altering the climate the

An with Jean Clottes mysteries of Chauvet Cave national geographic.com/ngm/0108. Also online, more of the cave's astoun art.

Marked in red: new subjects, new techniques



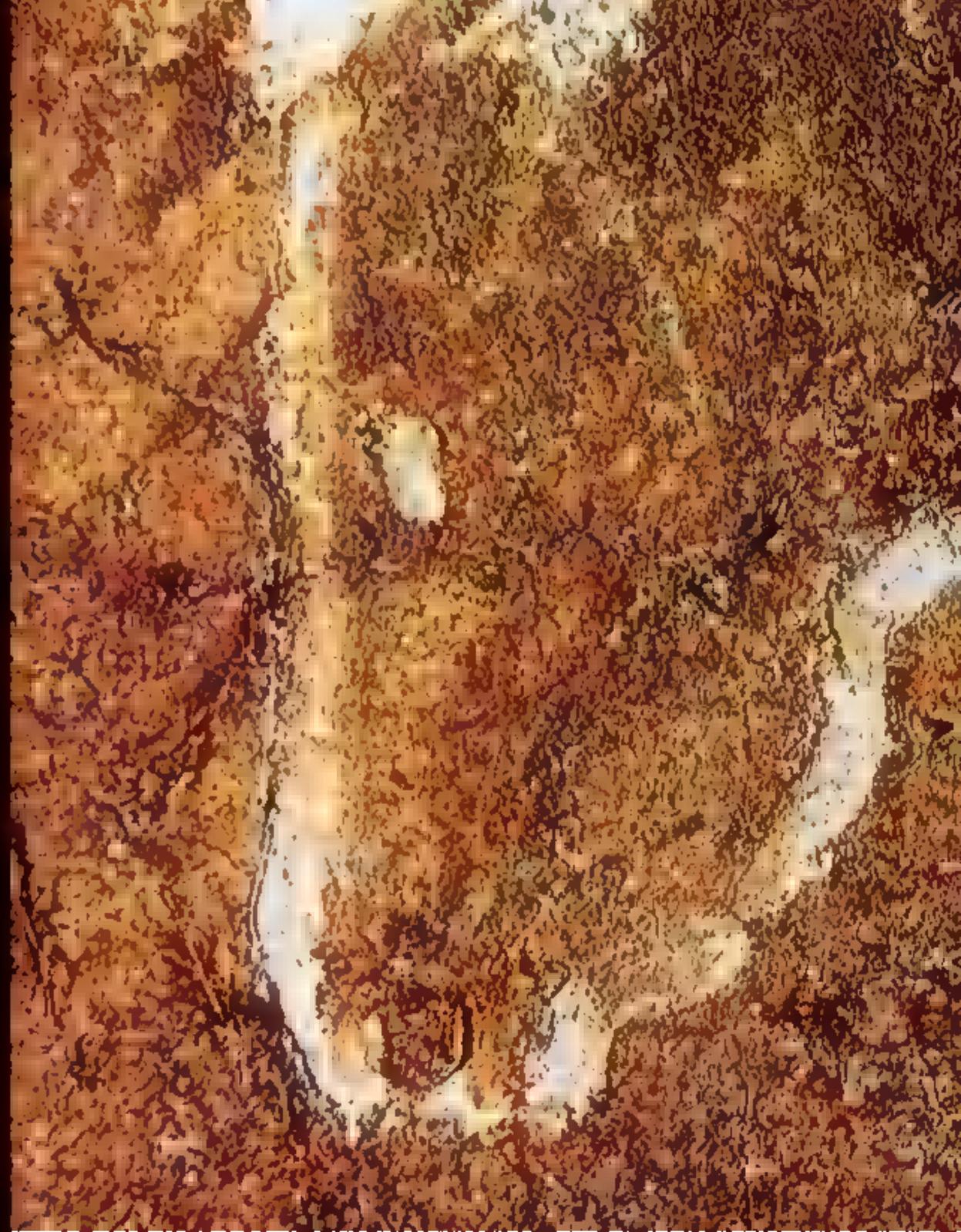
As if taunted by the [illegible] a cave [illegible] beneath [illegible] near one end of the [illegible] of the Bear Wallows. [illegible] this [illegible] cat is the first of its [illegible]. In

AUJOULAT-TOP: DOMINIQUE [illegible] AND VALÉRIE [illegible]

RECONSTRUCTION BY DOMINIQUE BAFFIER [illegible] VALÉRIE

The same animals appear again and again —

Red figures give way to white in Hillaire Chamber. Artists scraped away soft clay filming the walls, revealing limestone beneath. In the oldest representation found of the owl's ability to turn its head 180 degrees, a bird faces us, though its body and folded wings are seen from the back (below). Mane bristling, gaze alert, a horse trots across the 20-foot-long Panel of Large Engravings (top) along with mammoths and bison. Engraved amid bear scratches, the horse image retains the fingertip impressions of its maker (*mane detail, right*). Eaten, not ridden, by Stone Age Europeans, horses are common in younger cave art, which favors hunted animals. Chauvet's bestiary is different: Most of the identifiable figures are dangerous beasts—mammoths, rhinos, cave bears, cave lions—unlikely to have been part of the local Paleolithic diet.



repeated details create a great sense of unity.

A STUMPER IN LASCAUX. undulates across the End Chamber's Panel of Lions and Rhinos. In the middle, the wall of a low recess was scraped smooth for painting, and a black-haired horse was drawn off center, as if walking out of the rock itself. In dim torchlight such creatures would have materialized suddenly from the darkness—underworld spirits magically answering the artist's call.

JEAN CLOTTES

YANIK LE GUILLOU

In deep chambers fresh discoveries still beckon.

areas, team th[illegible] Le Guillou has
[illegible] the p[illegible] part-human figure
we call the Sorcerer (far left). This enigmatic
creature seems to [illegible] a woman [illegible]
by [illegible] and pubic triangle. Le Guillou's
[illegible] Chauvet first:
a painted mural (left). With [illegible] we
[illegible] glimpse
[illegible] filled this cave with life
and [illegible] so lately.

Chauvet continues to [illegible] Fires
[illegible] to [illegible] with still [illegible]
[illegible] with
[illegible] an extinct species of
deer [illegible] can
[illegible] events. The tusks of a
[illegible] were [illegible] sketched in [illegible] and
[illegible] a digital camera [illegible]
[illegible]

JEAN-[illegible] TOP: JEAN-

OCEAN GROVE, NEW JERSEY

BY ANGUS PHILLIPS

PHOTOGRAPHS BY AMY TUERSING

Waves erode the beach, but little else seems to change in Ocean Grove. Well, OK, they let you drive on Sundays now.

God's Square Mile

07756

People have been sleeping in tents at Ocean Grove, New Jersey, for more than 130 years. The little shore town is just 40 miles south of New York City, so the neighborhood has changed, but the spirit of a rustic summer worship camp endures.

"It's a place where God and country come together, like it used to be in days gone by," said Jeanne Dimmit, who drives from Arizona each summer with her husband, Howard, to relax and pray by the sea. "At night I hook the latch on the screen and say, 'Okay, we're secure.' It's the ultimate act of faith."

Then they sleep, perchance to snore. "One night I woke up and nudged Howard to get him to stop," said Jeanne. "When he rolled over, I realized it wasn't him snoring. It was someone in the tent next door."

If pilgrims are tightly packed in the heart of God's Square Mile, as Ocean Grove is called, they can take comfort in a civil lifestyle that nowadays lures as many tourists as true believers. The modest little Methodist town has become a destination for urban Easterners weary of bright lights, thick smoke, and loud music. They come for weekends where the sea breeze and purr of surf lulls them, where strangers smile and say hello, and where you can walk wherever you need to go.

Just over a hundred tents remain; the waiting list to nail down a lease on one can be seven years or longer. Tenters go to daily gospel sings and services near the century-old Great Auditorium. Others stay in bed-and-breakfasts, inns, and hotels that date from the late 19th century and frequent the beach, ice cream shops, and eateries on Main Avenue.

There are no bars in Ocean Grove; alcohol is not for sale. There are no movie theaters or fast-food shops. There's a stately boardwalk lined with iron streetlamps but nary a business or advertisement on it, save a flyer for the Sunday sermon.

07756

PERMANENT POPULATION: 4,256

SUMMER POPULATION: About 12,000

[illegible] LEASE ONE OF THE CAMP MEETING ASSOCIATION'S 114 TENTS: 7 to 10 years

NUMBER OF MOVIE THEATERS: None

FORBIDDEN ON SUNDAYS IN 1927: Driving, bicycling, swimming, dentistry, newspaper delivery

FORBIDDEN YEAR-ROUND [illegible]: Alcohol sales

Victorian facades (top), low hemlines, and polished chrome on '54 Hudsons—old-fashioned [illegible] good here.

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What to do in such a place? I wondered as I wandered on my first morning, bound down tree-lined Pilgrim Pathway toward the heart of town, exchanging "good mornings" with passersby.

I could not get lost though I knew not the way. I just aimed for voices raised in song. "Blessed Assurance" it was, echoing down the street. A Bible group had gathered in a tabernacle, its windows opened wide to the breeze, to study the Epistles. "Isn't singing in the morning wonderful?" the preacher asked before launching his sermon.

Enjoy the beach, but [illegible] before 12:30 on Sundays—you'll miss services at the Great Auditorium.

Voices have filled the air with sacred song in Ocean Grove since a group led by a bearded, stern-looking Methodist minister, the Reverend William B. Osborn, founded it as a haven of Christian renewal in 1869. He picked the site for the earthliest reason—Ocean Grove has few mosquitoes, and it's hard to pray while whacking bugs.

The insect situation remains blissfully unaltered, but a lot else has changed on the northern New Jersey shore. Population growth, leisure time, and automobiles brought development. Beach towns boomed and some exploded, like Asbury Park next door, whose oceanfront today is a battered shell, scarred by riots and abandoned by commerce.

But modest Ocean Grove, anchored in faith, soldiers on. It's odd, but this town built of the frailest stuff—a scatter of tents, a pine-paneled auditorium big as Noah's Ark, tightly packed cottages and wooden inns as dry as tinder—survives.

The auditorium is the core, an airy 6,500-seat arena erected in 92 working days in 1894, with a huge 10,000-pipe Hope-Jones organ that booms its musical message on Sundays to the tents and beyond.

Virtually every bit of ground in Ocean Grove is owned by the Camp Meeting Association, a group of 26 Methodist ministers and laity. The association leases the land for as little as $10.50 a year per 30-by-60-foot

Car insurance with
no State Farm Agent?
I'm not that brave.

Farm Customer Janet

Like a good neighbor, State Farm is there.

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lot, a colossal bargain, and many inns and homes that sprang up a century ago or more still stand, giving the place a Victorian look.

The pleasures are simple. At Nagle's, an 1890 pharmacy turned lunch counter, block-long lines form for ice cream in the evenings, and a sidewalk pianist bangs out show tunes on Saturday nights.

Tent colony life is cramped but sweet—folks bless their neighbors when they hear ■ sneeze.

Folks stroll a boardwalk with no concessions, no tattoo parlors, just weathered wood to walk on, silver moonlight on the sea, and the Atlantic's rumbles and whispers to savor. How quiet is Ocean Grove? "Well," a resident told me, "we used to call it Ocean Grave."

That was before state courts ruled in the late 1970s that using police to enforce a religious association's rules was a violation of the Constitution. Till then, laws banned beachgoing on Sunday, among other things.

On January 1, 1980, municipal powers were ceded by the Camp Meeting Association to Neptune Township. Ocean Grove today is more temperate, with a diverse population including many Roman Catholics, the township's Jewish mayor, a lively group of deinstitutionalized ex-mental patients living in a few unrestored inns, and a substantial gay population, including the past president of the chamber of commerce.

"I have a good friend who works as ■ diversity consultant," said Randy Bishop, the former chamber president. "He says Ocean Grove is the case study of a place where diversity really works."

It's a curious distinction for a town that made a reputation arresting people for sunbathing on Sundays. Perhaps tolerance is the fruit of all those years living cheek by jowl in tents.

That thought struck me while visiting Judy Geitner of Lynchburg, Virginia, one afternoon in the pin-neat canvas tent she and her husband, a former Presbyterian minister, share. They've been coming to Ocean Grove for 38 years. A woman working in her kitchen next door stifled a sneeze. Without thinking, I found myself muttering "Bless you" to a total stranger I couldn't even see.

Maybe, when conditions are right, grace just happens. □

MORE INFORMATION

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Final Edit

PUBLIC LANDS

Back at the Ranch

Some great photos are the product of complicated lighting and lens work; others involve pushing yourself or your equipment to extremes. Some, like this evocative shot of Elaine and Stacy Davies's children playing on a cattle chute, seem to fall from the sky. "Their mother had brought them out to meet their father for a picnic lunch," explains photographer Melissa Farlow, who was shooting Stacy for this month's article on public lands. "He has six boys, and even the five-year-old rides like a pro. After lunch they just started playing on the cattle chute." It would be hard for them to avoid the cowboy way. Stacy manages 5,000 head of cattle on the remote 450,000-acre Roaring Springs Ranch near Steens Mountain, Oregon, where his children are getting an upbringing from another era. "We're still in the wild, wild West," he says.

MORE ON OUR WEBSITE

You can send this picture as an electronic greeting card at **nationalgeographic.com/ngm/0108.**

Biotechnology researchers call it "golden" rice.

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"When mothers and their children eat an adequate amount of vitamin A in a daily meal, it could help alleviate more suffering and illness than any single medicine has done."

The excitement expressed by plant biologist Charles Arntzen reflects the golden opportunity that many see in a new strain of rice being developed with biotechnology. "Golden" rice contains increased amounts of beta-carotene, a source of vitamin A. Because rice is a crop eaten by almost half the world, golden rice could help relieve a global vitamin A deficiency that now causes blindness and infection in millions of the world's children.

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GNMENT

WEB RESEARCH

Spiderman Caught

Invertebrate enthusiast tries out arachnid lifestyle

Weaving a somewhat tangled web, author **Richard Conniff** dangles from his climbing ropes at the downtown YMCA in Worcester, Massachusetts. "I was thinking of how you could get into the soul of a spider," he says. "It seemed the best way was to try to build a web."

The exhausting experience humbled Dick, who is not a climber. "I've never put on a carabiner or a harness before in my life," he says. "But that's what working for NATIONAL GEOGRAPHIC is all about: going out in the field and trying something new. I'm in pretty good shape, or at least I thought I was before I did this."

Dick has long been fascinated by small creatures that others might find unpleasant, contributing GEOGRAPHIC articles on tarantulas and jellyfish. He also wrote *Spineless Wonders: Strange Tales From the Invertebrate World*. "I try to see them on their own scale; I think we'd find them more interesting than elephants if we looked at them eye to eye," he says. "Their behaviors are more bizarre, their weaponry more ferocious than what we're used to in big hairy mammals. I tell people to see the Serengeti in their backyards."

CARY WOLINSKY

AMY TOENSING

OCEAN GROVE, NEW JERSEY

A Day at the Beach

Dipping into the pleasures of the New Jersey shore, photographer **Amy Toensing,** at right, joins regulars Joyce Ricciardi Skeels, at left, and Beverley Ehrenfeld for their daily swim. "Beverley, who is 82, can stand on her hands in the water," reports Amy with delight. "We'd giggle and swim. It was a break from work for me."

Amy, who lives in Lincolnville, Maine, had never been to the Jersey shore. "The Maine shore is full of watermen, lobstermen, and it's rugged and rocky," she notes. "The Jersey shore is a long beach where people go to relax. Ocean Grove residents are very proud of their place; they want you to see it and experience it. That made my job easier."

Will she return? "Oh, yes," Amy says. "I have friends there now. That's the best thing about being on assignment."

For his part, outdoor writer **Angus Phillips** admits to being "flabbergasted" by Ocean Grove. "It was so quiet, so beautiful, and so close to New York City," he says. The writing assignment had an extra benefit: "I found the best Italian restaurant ever in the next town over," Angus reports.

WORLDWIDE

An uneasy rider, **John Mitchell** (below) loped through the Cascade-Siskiyou National Monument on horseback for his article on Bureau of Land Management lands. "This was maybe the fourth time I'd been on a horse since I was a boy," says John, a senior editor. "My horse tended to lag behind the others, then take off to try and catch up. I got bounced around quite ■ lot." The Cascade-Siskiyou surprised him: "It just doesn't match the bone-dry stereotype of BLM land."

MELISSA FARLOW

"I love geography," says author **Jeremy Schmidt.** "I like knowing how ■ landscape is put together—where rivers flow, what's on the other side of ■ mountain. I'm very aware of places I don't know, blank spots on my personal map." Clambering around the volcanoes of Kamchatka, an area nearly the size of Italy with less than half a million people, helped fill in a particularly wild blank spot.

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Find more stories about life on assignment from our authors and photographers, including their best, worst, and quirkiest experiences, at **nationalgeographic.com/ngm/0108.**

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Flashback

PIERRE DAYE

MEGATRANSECT III

Bridge to an African Past

By the time this photograph of Belgian colonials and Congolese natives reached our archives in 1919—part of a collection donated by Belgian journalist Pierre Daye—the GEOGRAPHIC already had a long history of stories on the region. In January 1899 a passage from "Lloyd's Journey Across the Great Pygmy Forest" presaged this picture. "Occasionally I came upon a very small natural clearing," wrote Albert B. Lloyd, "but generally speaking the growth was very dense. . . . In many places it was impossible to read even at noon."

This photograph was never before published in the magazine.

MORE ON OUR WEBSITE

You can send this month's Flashback as an electronic greeting card and access the Flashback photo archives at **nationalgeographic.com/ngm/flashback/0108.**

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Photographed by Gertrud and Helmut Denzau

WILDLIFE AS CANON SEES IT

A curious-looking bird with scant hairlike feathers jutting from its nearly bare head, a lesser adjutant walks slowly across low-tide waters searching for prey. Alone or in loose groups, this stork forages for fish and various aquatic animals. During nesting, adult pairs return to nearby forests throughout the day bringing food to their downy chicks. To conserve energy on the several-mile journey between feeding areas and the nesting colony, the storks ride thermal air currents to glide to their destinations. The lesser adjutant is threatened by loss of wetland and forest habitat, exploitation and human disturbance.

As a global corporation committed to social and environmental concerns, we join in worldwide efforts to promote greater awareness of endangered species for the benefit of future generations.

Lesser Adjutant
(Leptoptilos javanicus)
Size: Stands 110-120 cm tall
Weight: 4-6 kg
Habitat: Coastal and freshwater wetlands in South and Southeast Asia
Surviving number: Estimated at 5,000; population declining

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